Chemical Age

INDEX TO ADVERTISERS

The first figures refer to advertisements in **Chemical Age Directory & Who's Who,** *the second to the current issue*

(*Continued on page 604*)

INDEX TO ADVERTISERS

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SCIENTIFIC DESIGN

is the recognized leader in

LIQUID PHASE OXIDATION

plant design

Maruzen starts up SD-designed terephthalic acid plant in Japan

Mitsui continues to operate its plant at more than double initial installation and is largest producer in Asia

Maruzen Oil Company, Ltd. has placed onstream an SD-designed terephthalic acid plant near Maruzen's refinery at Matsuyama City on Shikoku Island. In 1957, Maruzen became the first Japanese company to place a petrochemical plant onstream.

Mitsui Petrochemical Industries, Ltd. has been operating its SD-designed terephthalic acid plant for over one and a half years, the first to produce terephthalic acid commercially from petroleum based feedstocks utilizing the liquid-phase air oxidation process. Mitsui is producing at a rate in excess of 30,000,000 pounds per year.

Imperial Chemical Industries Ltd., England, is nearing completion of their SD-designed terephthalic acid plant. The 30,000,000 pound per year plant is located at ICI's giant Wilton Works.

The SD-designed terephthalic acid plants employ the liquid-phase oxidation of aromatics process licensed by Mid-Century Corporation, a wholly owned subsidiary of Standard Oil Company (Indiana). Amoco Chemicals Corporation has an SD-built plant at Joliet, Illinois, for the production of phthalic, isophthalic, and terephthalic acids.

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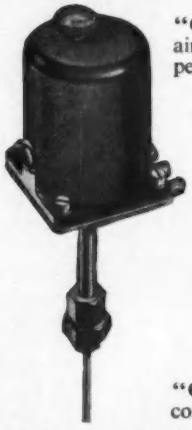
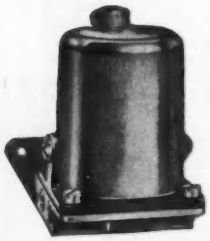
SD 198

TRANSMISSION CONTROL



"On plant" mercury-in-steel air-operated proportional temperature controller.
Publication No. R39



"On line" air-operated receiving controller. *Publication No. R31*

Mercury-in-steel air-operated temperature transmitter
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High thermal response. Wide range of temperatures.
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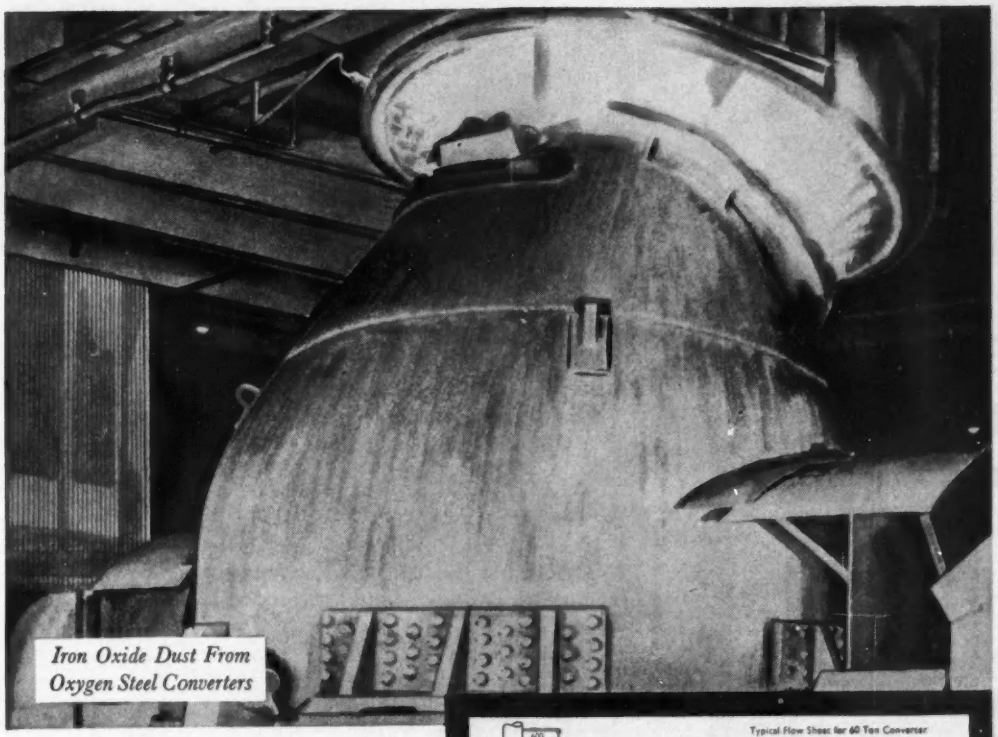
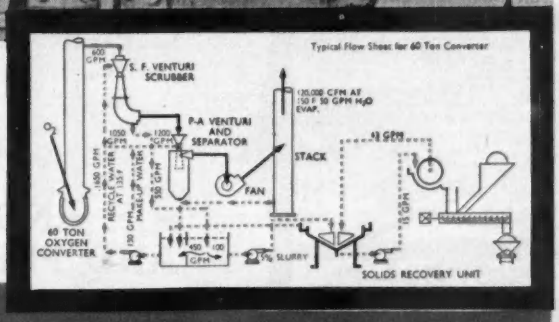


Iron Oxide Dust From Oxygen Steel Converters



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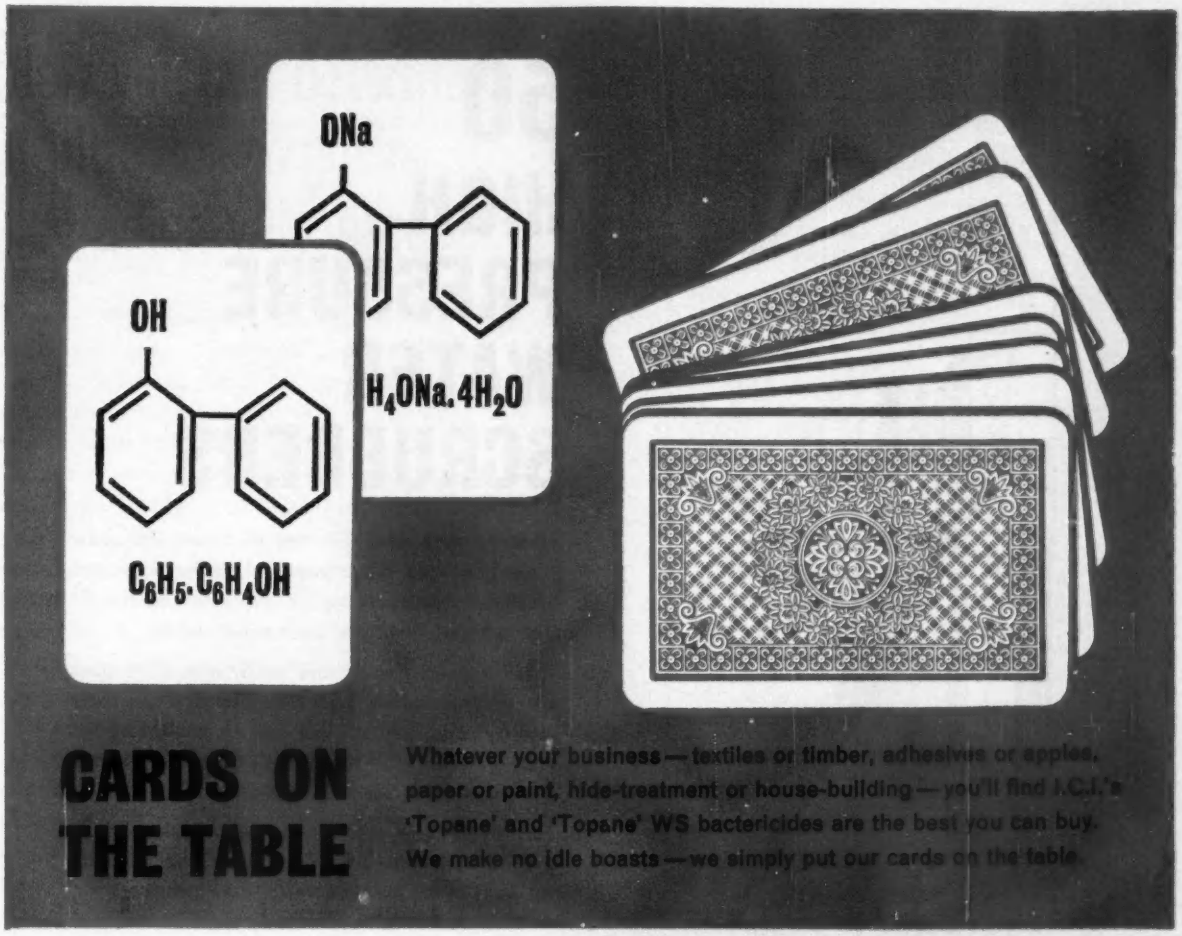

CARDS ON THE TABLE

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This is the table which compares 'TOPANE' with four other bactericides in common use

	Safety and Ease of Application (Max. 20)	Germicidal Efficiency (Max. 20)	Lack of Toxicity (Max 20)	Persistence (Max. 20)	Economy of Price (Max. 20)	(Max. 100)
Old type Non-Phenolic	10	2	10	1	20	43
Modern High Efficiency Non-Phenolic	12	20	1	20	4	57
Modern Phenolic Derivative (1)	16	9	14	15	8	62
Modern Phenolic Derivative (2)	15	12	10	17	15	69
'TOPANE'	**20**	**11**	**20**	**12**	**12**	**75**

'Topane' (I.C.I.'s brand of ortho phenylphenol) is soluble in organic solvents. It provides a valuable base for household and industrial disinfectants, for it extends their range of bactericidal effectiveness. Other specific formulations — for example, for the treatment of wet and dry rot in timber — may be economically based on 'Topane'.

'Topane' WS (I.C.I.'s brand of sodium ortho phenylphenate) is the water-soluble grade of 'Topane'. It is valuable wherever health considerations call for a water-soluble germicide of low toxicity—e.g., in paper impregnation, cleaning ships' meat-cargo holds, etc.

Both 'Topane' and 'Topane' WS are supplied as non-dusting, free-flowing, safe-to-handle flakes.

For further information write to your nearest I.C.I. Sales Office or to

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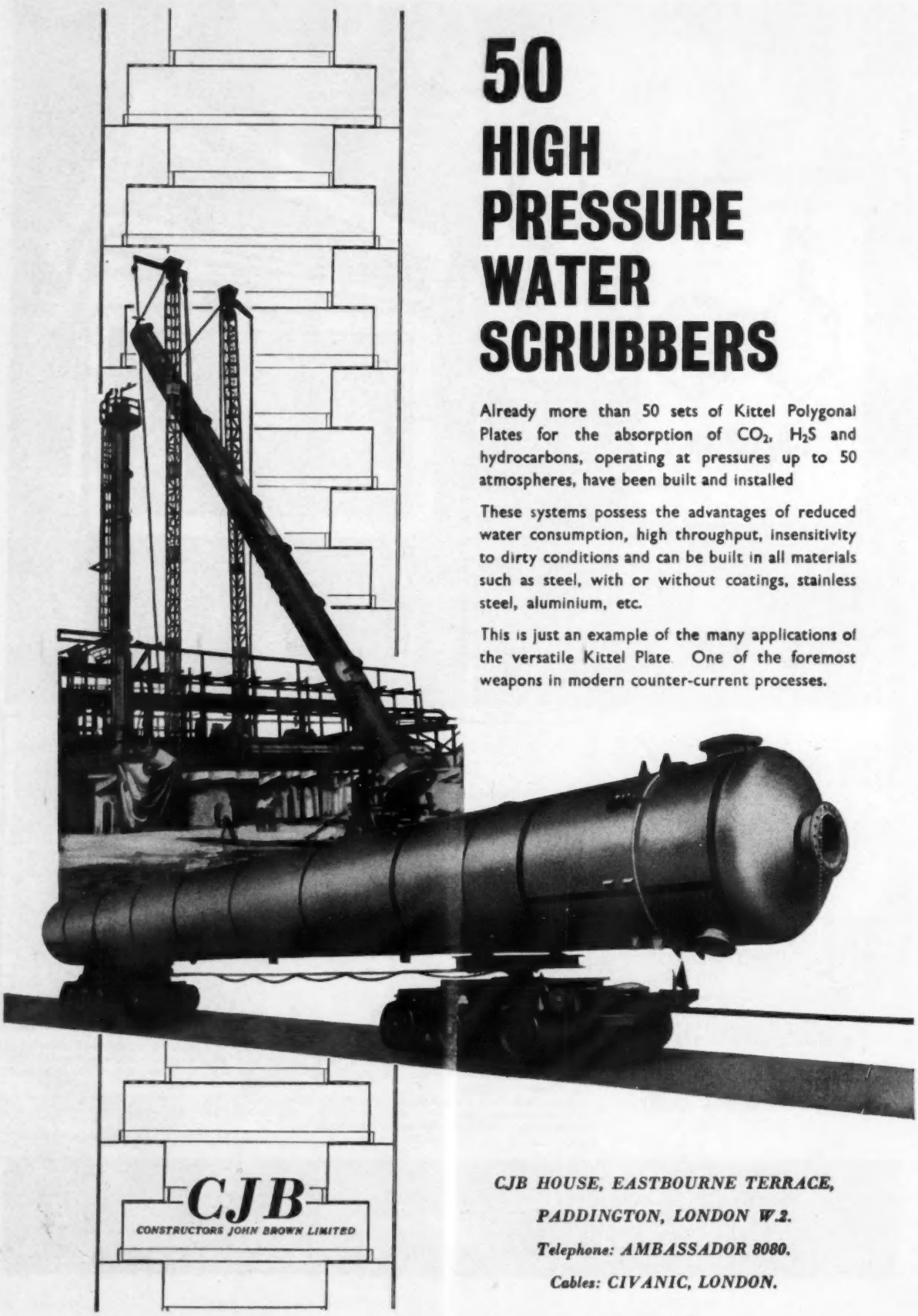

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Cover duplicate samples of your material with these two sheets, and expose them to the sun. If you wish to accelerate the test, use a Fade-Ometer. By examination of your samples after exposure, you will be able to judge if product degradation due to ultraviolet rays has occurred. And you will see demonstrated the exceptional effectiveness of CYASORB UV Light Absorbers. These Absorbers are available in different forms. Manufacturers of polyester, polystyrene, vinyl and surface coatings throughout the world are improving their products with them. You, too, may be able to use our Cyasorb products to your advantage. Send for your test kit today!

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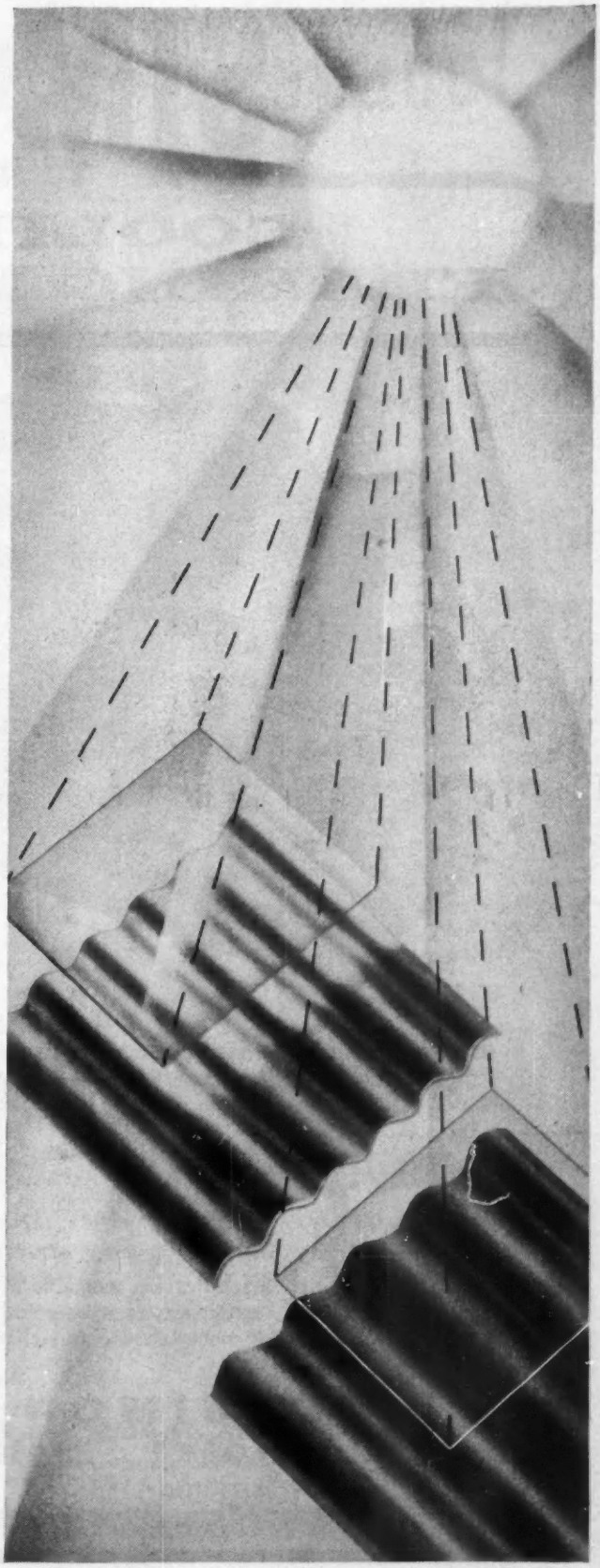

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IN THIS ISSUE

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CHEMICAL AGE

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RESEARCH IN INDUSTRY

LATEST annual report of the Advisory Council on Scientific Policy (1959-60) (H.M.S.O., 1s. 9d. net) is rather more heartening than some previous reports, for it shows that Britain's effort in pure science in recent years has been good, although many of the applied sciences have been neglected.

Lord Hailsham when Lord Privy Seal, it will be recalled, exhorted industry to spend more on scientific research. The Advisory Council report shows two notable improvements: a fast-rising Government civil research spending, excluding research councils; and industry providing a greater percentage of money for research than before. Thus total U.K. spending on scientific research and development in 1958-59 rose by £117.8 million, or 59% over the 1955-56 figure of £300 million. The 1958-59 total of £477.8 million accounted for 2.3% of the gross national product (the comparable U.S. percentage is 2.74).

In 1958-59 research and development carried out in private industry totalled £266.3 million (£185 million in 1955-56), and this represented 55.8% (61.7%) the total research spending. Over the same period, industry footed £136 million of the £477.8 research bill (28.5%), compared with £68.3 million (22.8%). Non-defence spending in 1958-59, at £243 million, was almost doubled.

It is now clear that there is no longer the big discrepancy between U.K. and U.S. expenditure on civil research and development that was noted a few years ago. Nevertheless, a number of important changes are still called for in British science and technology and the report warns that "there is little prospect of real solution of the development problem, and our competitiveness as an industrial power will be in jeopardy."

Faced with limited resources of manpower and finance, it is not yet possible for Britain to be active in every field of science. Some fields have, in modern circumstances, been shown to be important on national grounds. In particular, the research effort in engineering has been insufficient. This is intimately bound up with the economic production of new materials and the improvement of existing ones, for with space research and new metallurgical techniques in mind, there is a need for materials capable of operating at much higher temperatures than at present. To overcome the considerable gap in this field, there must be greater collaboration between chemists, physicists, mathematicians and metallurgists.

There is also a pressing need for research into the sources and utilisation of energy. The Ministry of Power and the University Grants Committee have been asked to consider ways of strengthening studies in coal technology; there is also a need for the further application in industry of refined techniques of control.

There is a significant absence of basic research in conservation and long-term utilisation of water supplies and minerals. The Council believes that this subject may well justify examination of the case for a research council with central responsibilities. Certainly the chemical industry in its expansion projects is vitally concerned about water supplies (see also p. 630).

On balance, the report is encouraging, but it is obvious that industry as a whole must devote still greater attention to research.

★ I.C.I., who have had the nylon field to themselves with production of nylon 66, will in a few years have competition on their hands from at least one other producer, possibly two. British Enka, the U.K. associate of Algemene Kunstzijde Unie N.V. (A.K.U.), who earlier this year (CHEMICAL AGE, 16 April, p. 644) announced their intention to make nylon 6, are now negotiating with Grangemouth Town Council for a factory site to make the fibre. At the same time it is stated these plans envisage drawing the raw material from British Hydrocarbon Chemicals, who do not at present make caprolactam.

British Enka, who told me on Monday that Grangemouth is one of a few other sites being considered, received licences to produce nylon 6 in 1956. These have since been exploited in Italy, the Netherlands, the U.S., and West Germany. At the same time, licences were also granted to British Celanese, who are understood to have carried out development work. A few weeks ago, CHEMICAL AGE reported that Courtaulds Ltd., parent company of Celanese, had acquired U.K. rights to the Snia Viscosa caprolactam process.

Since the British Enka announcement earlier this year, I.C.I. have released details of their own plans to make nylon 6, involving a £10 million investment. No site has been named, but with British Nylon Spinners (jointly owned by I.C.I. and Courtaulds) in South Wales, Severnside seems the likely place. Lion's share of the nylon 6 market will go to the company first off the production mark and my feeling is that Courtaulds, who have had least to say on the subject, might surprise everyone.

★ ENFORCEMENT of food laws in this country is in the hands of local authorities, resulting in wide disparity in interpretation. So far as the pesticide residue problem is concerned, this is left to the discretion of farmers who are expected to use the materials properly. At a recent lunch in New York, held as part of the meeting of the American Chemical Society, Dr. Alan G. Kitchell of the British Joint Services Mission, stated that the U.K. might eventually adopt the tolerance system for regulating pesticide residues.

Dr. Kitchell referred to differences in the law compared with the U.S., where manufacturers are required by law to carry out toxicity tests (this is not so in the U.K., although of course it has long been standard practice). All that the U.K. law requires is that British manufacturers should supply the Agriculture Ministry with whatever toxicological data they have. He thought that more emphasis would have to be given to this kind of testing in the future.

Biological testing of food additives has not received the emphasis in the U.K. that it has in the U.S., and Dr. Kitchell cited recent proposals that Britain should set up national biological testing stations.

★ THE Wellcome Foundation has come a long way since the day 80 years ago that Silas M. Burroughs and Henry S. Wellcome signed the legal documents establishing Burroughs Wellcome and Co. with a modest £2,000 capital. Business was conducted from 'the house and buildings' at 8 Snow Hill, London, with less than 100 employees.

The firm prospered from the start for the time was ripe for the introduction to the U.K. of American pharmaceutical preparations. Within five years, the capital was raised to £15,000 and by the time Burroughs died in 1895 it reached almost £125,000.

Today no octogenarian could be healthier. The Wellcome Foundation is known and respected throughout the world; its latest enterprise, the Wellcome Veterinary Research Station at Frant, being opened this summer by Lord Hailsham.

★ ON Monday I saw the English language version of the colour film 'Between Formula and Form', produced by the research and development department of Chemische Werke Hüls, to show the many roles played by plastics and synthetic rubber in home and industry. A first-class production, the accent was on application research.

My only quarrel with this excellent film was a 'terminological inexactitude', which drew subdued gasps from many of the preview audience at the Waldorf Hotel. The cause was a bland announcement from the commentator that polyethylene had made vast strides since its first commercial development in 1953; at that time it was stated to be a laboratory curiosity with only a few grammes in existence!

I.C.I. might well be excused wondering just what polymeric substance it was that their Alkali Division researchers discovered in 1933 and which was first put into commercial production—following various pilot plants—on 1 September 1939. Incidentally this historic plant has only recently gone out of production.

★ I SEE that, to get factory workers more interested in accident prevention, the Royal Society for the Prevention of Accidents is proposing to set up two clubs, the Y.Z. Club and the Golden Eye Club, membership of which will be confined to factory personnel "whose foresight in wearing protective clothing designed for the purpose averted injuries to their heads and eyes while at work".

These unusual membership qualifications are intriguing. What will members talk about when they meet? Will they merrily chaff each other with such sallies as "Lucky old Bill, wearing that tin hat just when the chief chemist happened to fall off the top of the No. 2 Reactor—I know you'd only just put it on to keep the rain off!" Or will they, a silent, grateful band, soberly meet at the club to play darts, billiards or (wearing suitable protective clothing) table tennis?

Whatever these clubs will be like, they are hardly likely to interest old Bert, a veteran process worker of my acquaintance. Reaching up to get his cap off a clothes peg the other day, he inadvertently dislodged a steel helmet, which fell on his face. "Look what pertective clothing 'as done for me," he says. "I couldn't wear a pair of goggles now, even if I wanted to—not till this flippin' bump on me eye 'as gone down."

★ BUT, seriously, the efforts of RoSPA to make workpeople more safety conscious deserve nothing but praise, for accident figures show, beyond dispute, that many industrial mishaps could be avoided by taking proper precautions. For instance, during 1959 there were 8,027 injuries to the head of sufficient seriousness to cause the injured person to be absent from work for three or more days. These could have been averted by the wearing of helmets. There were 72 fatalities caused by falling objects, many of which could have been similarly avoided. Of the 6,184 eye injuries many could have been avoided by wearing suitable eye protection.

★ READERS who have been following the 'Scientific Russian Without Tears' series in this journal will know that, in Russian and kindred languages, words do not necessarily mean what they look like to us. All the same, it seems singularly appropriate that, in Czechoslovakia, a newspaper which rejoices in the name of *Rude Pravo* should take to task the builders of an oil pipeline which is reckoned to be about 25 miles behind schedule.

The pipeline referred to is the 400-km. Czechoslovak portion of the 2,500-mile Comecon pipeline system which will pipe oil from the U.S.S.R. to Poland, East Germany, Czechoslovakia and Hungary. Work on the Czech portion was begun about a year ago by the State enterprise, Plynostav, who contracted to finish it by the end of 1961. Some 186 km. were to have been completed this year, but, *Rude Pravo* complains, delays have steadily mounted until the deficit reached 40 km. in September.

Alembic

Project News

Badger, Bechtel and Wimpey to Build B.P. Aromatics Plant

THE **British Petroleum Co. and California Chemical Co.** have announced a £7 m. joint venture calling for the immediate construction of two aromatics manufacturing plants in Europe. The joint undertaking will be known as B.P. California, and British Petroleum will operate the units on its behalf. The units will be located adjacent to existing B.P. refineries at the Isle of Grain, Kent, and Dinslaken, West Germany.

In their initial phases the two installations will together produce 19,000 tons/year of orthoxylene, 16,000 tons of ethyl benzene raw materials for plastics, and 22,000 tons of paraxylene. The first production from the units is scheduled for late 1961.

Contracts for building the Kent plant are being discussed with Badger, Bechtel and Wimpey. Contracts for the Dinslaken plant have not yet been signed.

California Chemical are a subsidiary of the Standard Oil Company of California. Previous rumours (see CHEMICAL AGE, 30 April, p. 714) connected British Petroleum plans for setting up aromatics plants in the U.K. and West Germany with the Oronite Chemical Co. (now renamed California Chemical), the figure of £9 million being suggested as the probable capital investment involved. The aromatics concerned were alleged at that time to be *o*- and *p*-xylenes, benzene and ethyl benzene.

Leith Dock Store for Fison's Fertilizers

● A SIX-ACRE SITE at Leith Docks has been acquired by **Fisons Fertilizers Ltd.** Fisons are to build a store on the site which will incorporate the most modern features. Fertilisers will be received from ships in the Imperial Dock and will pass through a high-speed bagging plant. The despatch arrangements will be based on the extended use of fork lift trucks and pallets.

Grangemouth as British Enka Nylon 6 Site?

● DISCUSSIONS are in hand between **British Enka Ltd.** and Grangemouth Town Council for the location of a new factory in the area for the production of nylon fibre. The raw material, it is stated, would be obtained from **British Hydrocarbon Chemicals.** Grangemouth is said by British Enka to be one of a number of sites under consideration.

Chemico-Whessoe Get First CO Reduction Contract

● UNDER their co-operation agreement announced earlier this year (CHEMICAL AGE, 16 January, p. 140), **Chemical Construction (G.B.) Ltd.** and **Whessoe Ltd.** have secured a contract for the design and construction of a Chemico catalytic carbon monoxide removal plant for town gas from the West Midlands Gas Board. No details are available on the project either from the companies concerned or the gas board, but the site is believed to be in Birmingham.

The Gas Council annual report (see p. 625) refers to the pilot scale testing of 'guard' catalysts for CO removal, now being carried out in collaboration with contractors.

Wills Give Lime Soda Contract to Boby

● WILLIAM BOBY AND CO. LTD., Rickmansworth, Herts, have been awarded a contract for a lime-soda plant at W. D. and H. O. Wills' No. 4 factory, Bristol. The contract is valued at about £2,600.

Soviet Detergent Material Contracts for C.J.B., Marchon

● CONTRACTS totalling nearly £3 million for the design, supply of equipment for and commissioning of two factories to manufacture raw materials for detergents have been awarded to **Constructors John Brown Ltd.** in association with **Marchon Products Ltd.**, Whitehaven, by **Techmashimport**, Moscow. The design of these plants will be based on know-how supplied by Marchon Products, a member of the Albright and Wilson Group.

No details have been released of the types of products to be produced in the two Russian plants, their capacity or location. It is understood that the two plants will be in the same locality.

It was noted in CHEMICAL AGE, 24 September, p. 485, that outstanding Soviet projects for which contracts had not been placed included plants to produce 5,000 tons/year of synthetic fatty alcohols, 5,000 tons/year of fatty acid alkylamides, and also plant for sodium tripolyphosphate production.

B.H.C Olefin Production

● OLEFIN production at the Grangemouth facilities of **British Hydrocarbon Chemicals Ltd.** is about 330,000 tons a year, and not 130,000 tons/year referred to in CHEMICAL AGE, 8 October, p. 575. The 130,000 tons/year figure referred to ethylene production only.

No Confirmation of B.D.H. Bid Talks Rumour

RUMOURS that a large pharmaceutical group are negotiating for a merger with or take-over of British Drug Houses have not been confirmed by B.D.H. The company's ordinary shares rose in price in the latter part of this week.

Earlier in the year, B.D.H. rejected a share and cash offer from Fisons.

Building Schedule Maintained for I.C.I. Silicone Extension

CONSTRUCTION of the extensions to **I.C.I.'s Nobel Division's** silicones plant at Ardeer is on schedule and the first major item of new equipment should be ready for operation early next year. The extended plant will include the most modern equipment and processes and the considerable capital expenditure involved was authorised by the I.C.I. main board in January.

Since the beginning of the year, more than 12 new products, including greases, rubbers and oils, have been added to the division's range. A promising new market is seen to be opening out for silicones in the production of polyurethane foams.

The division's new methyl cellulose plant at Dumfries is now being commissioned. The products concerned will be marketed as Methofas.

At Ardeer, the new nitric acid plant, using the intermediate pressure ammonia oxidation process (I.O.P.), is now providing all the site's acid, enabling one atmospheric oxidation plant and two pressure oxidation units to be closed down. Adjacent to the new I.O.P. plant, a second nitric acid concentration unit, using the magnesium nitrate route, is being constructed and good progess is reported. Work on the 120 ft. high steelwork frame has been completed; this plant is due for completion by the end of the year. Eventually it will be operated from with the I.O.P. plant from a common control room.

Chemical Plant Deliveries Still Not Satisfactory

QUESTIONNAIRES on the "unsatisfactory deliveries" of chemical plant and equipment, circulated in the London and South East and Scotland by the Association of British Chemical Manufacturers have showed that the position is still not satisfactory. At their recent meeting, members of the A.B.C.M. productivity committee discussed ways of improving matters, particularly with regard to stainless steel. Joint action by A.B.C.M. and the British Chemical Plant Manufacturers' Association was recommended on stainless steel.

It was decided not to arrange a competition on variety reduction, proposed by the British Productivity Council, because the chemical industry was more concerned with variety reduction of its supplies than of its products. The committee agreed, however, to support the organisation by B.P.C. of a national competition on the subject.

Europe's Chemical Makers Move to Solve Free Trade Problems

ASSOCIATIONS representing chemical manufacturers in 10 European countries meeting in West Berlin last week decided to collaborate even more closely in an attempt to solve the difficulties arising from the existence of two economic groups in Europe. To this end, it was decided to examine the specific problems requiring solutions if the two blocs (European Economic Community and European Free Trade Association) are to be brought together.

The meeting, held from 2 to 4 October, was of the presidents and directors of the Centre Europeen des Federations de l'Industrie Chimique (C.E.F.I.C.), comprising the associations of Austria, Belgium, Denmark, France, Italy, the Netherlands, Sweden, Switzerland, the U.K. and West Germany. It was one of a series at which the chemical industry has considered the economic problems of integration in Europe.

Members present agreed that there was considerable common ground between the member associations, which undertook to consider in detail in their own countries the possible effects on the main sectors of the chemical industry of a free market covering the whole of West Europe.

The Association of British Chemical Manufacturers was represented by Sir William Garrett, chairman, Mr. John C. Hanbury, vice-chairman, Mr. George Brearley, director, and Mr. Herbert W. Vallender, who the previous week had represented A.B.C.M. at the Canadian Tariff Board hearing on chemicals (CHEMICAL AGE, 1 October, p. 538).

U.K. Producers Seek Anti-dumping Duty on Cut-price Vinyl Acetate Imports

MOUNTING imports of vinyl acetate monomer from the Continent at prices that are highly competitive, even after a 33⅓% import duty, with U.K. ex-works prices, have led to an application for the imposition of an anti-dumping duty, under the Customs Duties (Dumping and Subsidies) Act. This application applies to vinyl acetate monomer imported from Italy and Switzerland. The largest source of imports has been West Germany, with other smaller quantities from the Netherlands and Norway.

Representations on the application should be submitted to the Board of Trade in writing not later than 28 October. A statement of the applicant's case will be made available to those wishing to make representations if they undertake to treat the information as strictly confidential and to allow their comments to be passed to the applicants for reply. Requests for a statement of the case, with the undertaking sought, should be sent in writing to the B.o.T. Tariff and Import Policy Division, Room 3136, Horse Guards Avenue, London S.W.1.

U.K. usage of vinyl acetate monomer in 1958 was around 12,000 tons. Since then consumption has risen sharply and is now between 15,000 and 20,000 tons/year. The 1960 import total is running at an annual rate of 7,800 tons (compared with an actual import total of 5,375 tons in 1959).

The two U.K. major producers of vinyl acetate monomer are British Celanese Ltd. and Hedon Chemicals Ltd., owned by the Distillers Company Chemical Division and Shawinigan of Canada. Hedon Chemicals currently have a modification project in hand for their Hull plant. This is being engineered by D.C.L. and is due for completion by early-1961.

Producers in Italy are Montecatini and Soc. Edison, while Lonza make vinyl acetate monomer in Switzerland.

Imports of this chemical in the first eight months of this year totalled 5,197 tons (3,951 tons), valued at £588,734 (£427,856). Imports from Switzerland in the first seven months were: January 40 tons; March 60 tons; April 39 tons; May 19 tons; June 38 tons; July 38 tons. Figures for Italy were: February 185 tons; May 196 tons and July 176 tons.

Price per ton of the Swiss product varied from an average £100.75 to £106.39, while the price per ton of the Italian product imported in July was £97.15. West German imports have been much higher than either the totals from Switzerland or Italy; the December 1959 figure was 500 tons, but prices have averaged between £100 and £112 per ton. (In each case the prices quoted have been ex-works and before the addition of the 33⅓% import duty.)

Chemical Production Index in June

BOARD OF TRADE index of industrial production for the chemical and allied industries in June was 144, compared with 149 in May, and 135 in June 1959 (the index is based on a 1954 average of 100). The index for general chemicals, etc., was 147 in June, a decline of 4 points on May, but 11 points up on June 1959. For coke ovens, oil refineries, etc., a provisional July index of 135 is given (132 in June, 138 in May and 124 in July 1959).

The index for all industries in July is given as a provisional 110 (119 in June, 125 in May and 103 in July 1959).

Search for Cheap Process for Sulphur Removal

THE Fulham-Simon-Carves ammonia process for the removal of sulphur compounds from flue gases is discussed in a report of the Department of Scientific and Industrial Research entitled 'The Investigation of Atmospheric Pollution—Research and Observations in the year ended 31 March 1938'. The process has been operated successfully on a large pilot plant by Simon-Carves Ltd. and the Central Electricity Generating Board. Commercial development, however, depends on the availability of supplies of gasworks ammonia liquor, and work has continued with the aim of discovering a cheap process of wider applicability.

Methods tried out have included wet processes that would give sulphuric acid as an end product, and dry absorption processes. Work has continued on a catalytic manganese process in which sulphur dioxide and oxygen are absorbed in water containing manganese ions as catalyst, and produce dilute sulphuric acid.

Sulphur dioxide emitted during the period under review totalled 5.4 million tons (5.27 million tons in 1956-57).

Russian Patent Law and Procedure

A NEW catalogue on their patents abstract service is available from Derwent Information Service, Rochdale House, Theobalds Road, London W.C.1. These services cover fine chemicals, plastics, petrochemicals and metallurgy.

Also included is a useful article on 'Russian patent law and procedure,' which is based on lengthy discussions between the author, Mr. H. Hyams, F.R.I.C., and Soviet authorities on patent matters. Mr. Hyams states that in some respects the Soviet patent system is very similar to that of western countries, notably Germany, but in many aspects is intriguingly different. Foreigners can be reasonably sure, he says, of financial reward by applying for protection of worthwhile inventions in the U.S.S.R.

Sodium Cyanide Fatality

One man was killed and five others received burns in an accident involving a bath of molten sodium cyanide in the heat treatment department of Turner Manufacturing Co. Ltd., Wolverhampton, on 10 October. The men, all maintenance staff, were working on the bath when an asbestos cover fell into it, and were splashed with the molten contents. The violent displacement of the sodium cyanide is attributed to the rapid expansion of the cold asbestos cover on contact with the chemical.

Clyde Shipbuilders Enter Plant Fabrication Field

The Elderslie dockyard section of Barclay Curle and Co., Ltd., the well-known firm of Clydeside shipbuilders, are carrying their diversification programme another step forward and are now successfully handling fabrication work for the chemical and allied industries.

Gas Council's Annual Report

POLICY COMMITTEE TO STUDY NEW METHODS OF PRODUCTION

THEIR belief that the development of new methods of gas production and the study of new sources of gas supply should be carried out on a national basis has led the Gas Council to appoint a production policy committee and to set up a development and planning section. This is announced in the council's annual report for 1959-60, published on Tuesday.

Highlights of the report show a continuing decline in the production of crude by-products, although demand for refined products is strong. A co-operative study of processes for the production of pure benzene is in hand.

On the research side progress has been made on slagging gasifiers; a new pilot plant for catalytic gasification of light distillate steam is nearing completion; 'guard' catalysts for CO reduction are under test with contractors; a new biochemical decomposition process is to be operated on a large pilot plant.

Methane Imports. Economic aspects of large-scale imports of liquefied natural gas and of possible sources of supply are being studied. Gas Council's share of the *Methane Pioneer* voyages was £312,836 (£93,500 in 1958-59)

H.P. Hydrogenation. Ordering of plant not already under construction for the high-pressure hydrogenation of oil and coal project of the North Western Gas Board was suspended because the revised estimated cost substantially exceeded earlier expectations. Construction will restart when further progress has been made in research at the Midlands Research Station, necessary before the hydrogenator design can be completed.

Slagging Gasifiers. Slagging gasifiers cut steam consumption and a satisfactory method for withdrawing the slag has been developed at the Midlands Research Station, using a pilot Lurgi gasifier operating on coke. Alterations are needed to the slag trap and modifications to enable the plant to work on coal were being designed at the end of the period. When these are completed, the pilot gasifier of 1 m. internal diameter will have an output of 4-5 million cu. ft. a day.

Also under study is the gasification at pressure of powdered coal using oxygen and steam, the main interest being the gasification of the powdered char from a fluidised hydrogenator.

Town or Rich Gas from Coal. A two-stage process for the hydrogenation of coal at pressure in a fluid bed is in hand, the first stage being a preliminary hydrogenation to render the coal non-caking and produce liquid hydrocarbons, this being followed by hydrogenation to give gaseous hydrocarbons. To study the main hydrogenation reaction, preliminary tests have been made on a pilot plant at the Midlands Research Station in a counter current fluid bed of coal. A pilot unit for the fluidised pretreatment of coal is being commissioned.

Town or Rich Gas from Petroleum. Gases of high calorific value can be made in the experimental plant for the gasification of petroleum fractions by their non-catalytic interaction with highly superheated steam. Final process for the pressure hydrogenation of coal can best be studied through the hydrogenation of oil and the full-scale pilot plant planned by the North Western Board will be used.

A gas suitable for peak load purposes can be produced at high pressure by the catalytic pressure gasification of light distillate steam. A pilot plant of 200,000 cu. ft. a day capacity should be completed during 1960-61.

Reducing CO. Iron oxide-chromium oxide catalysts for CO removal foul rapidly in contact with hydrocarbon gases and a search is in hand for a method of removing the fouling agents before the gases enter the shift converter. Promising small-scale results have been obtained with two or three 'guard' catalysts. These are now being tested on the pilot plant scale in collaboration with the contractors.

Arrangements are under way for the pilot-scale testing of a catalytic process to convert hydrogen sulphide to sulphur. The South Eastern Board's process for the removal of H_2S from carrier by an organic oxygen carrier met difficulties in operation on a pilot scale; alternative solvents are now being studied.

Effluent Disposal. Because of the high cost of chemical treatment of aqueous effluents (phenols, thiocyanate and thiosulphate), a process for the biochemical decomposition of the toxic components is under development at the London Research Station. The process will be operated in the immediate future on a pilot plant of considerable size.

Strong Demand for High-purity Products is Background to Benzene Process Study

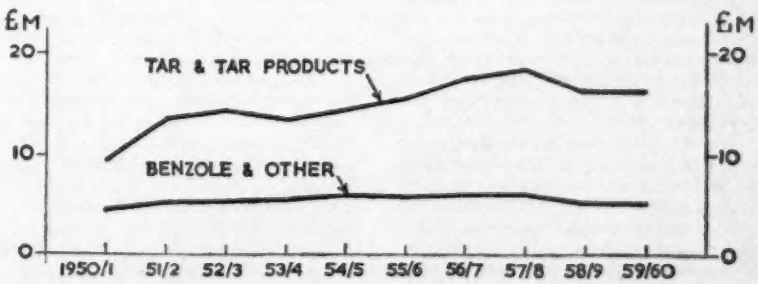
GAS industry production of crude by-products continued to decline in the year ended 31 March, although at a slower rate. This followed reductions in coal carbonisation and the increased use of other raw materials for gas manufacture. The Gas Council's annual report for 1959-60 states that market conditions had shown some improvement over the previous year in all products, except pitch and coal tar fuels.

Tar Products. Production of crude tar, which fell by 100,000 tons to 1.7 million tons, was largely sold to co-operative distillers, but 400,000 tons were distilled by area boards, mainly, North Thames and South Eastern. A substantial quantity of refined tar was sold for roadworks. An improvement in exports was apparent towards the year-end.

With weak demand continuing, prices of coal tar fuels fell to low levels, leading to output cuts in favour of more remunerative products. This lower production was accompanied by some change in quality due to increased production of high grade solid fuels; as a result many distillers have had to remain in the liquid fuel market to dispose of pitch and creosote unsuitable for sale in any other form.

Disposal of increased quantities of light creosote, made available by termination of the tar industry's contract with I.C.I., was still a major problem; large quantities were used as fuel. The North Thames Board had completed a continuous distillation plant for separating the oil into saleable components, thereby yielding higher quantities of phenols, naphthalene, etc.

Demand for refined products remained



Sale of tar and other by-products, before stock adjustment

GAS INDUSTRY STATISTICS ON BY-PRODUCTS

	1955-56	1958-59	1959-60
		'000 Tons	
Coal tar, crude			
Made	1,912	1,739	1,637
Bought	45	37	62
Used	504	435	418
Sold	1,474	1,329	1,298
Oil gas tar, crude			
Made	84	93	79
Bought	3	—	—
Used	24	22	19
Sold	54	69	62
Benzole, crude		'000 Gallons	
Made	28,841	25,266	24,467
Bought	341	81	42
Used	18,140	17,095	17,063
Sold	10,959	8,512	7,391
Benzole, refined			
Made	12,355	11,385	11,259
Bought	663	927	966
Used	6	—	11
Sold	12,912	12,279	12,248
Spent oxide		'000 Tons	
Made	268	227	232
Bought	1	—	—
Used	47	43	35
Sold	233	191	196

strong and the trend towards maximum recovery continued. In view of the call for naphthalene for phthalic anhydride, exports of naphthalene had been voluntarily restricted in accordance with the agreement made by all U.K. producers.

Benzole Products. Crude benzole extracted totalled 24,467,000 gall., 799,000 gall. below 1958-59. As with coal tar, changes in quality were leading to a crude material of increasing low gravity. This change was reflected in the economics of refining as the low gravity products earned a lower return, particularly in the motor spirit market. Chemical industry demand for pure benzene continued strong and in an attempt to take advantage of this market two boards had begun a co-operative study of various processes for the production of pure benzene from crude benzoles.

Under E.F.T.A., the preference on light hydrocarbon oils would be, on or before 1 January and unless some other form of protection was given, it might well become uneconomic for the gas industry to continue benzole extraction and refining.

Ammonia Products. Disposal of gas liquor continued to be a problem. Most of the liquor was distilled by area boards and distillers for the production of ammonium sulphate and ammonia solution, but a substantial quantity was sprayed directly on to the land. This was now the most profitable way of dealing with gas liquor in agricultural areas and the amount disposed of in this way had increased from 6.3 million gall. in 1953-54 to 59.1 million gall. in 1958-59 and 75.9 million gall. in 1959-60.

Spent Oxide. Allowing for exports, production of spent oxide was roughly in balance with consumption for sulphuric acid manufacture. The financial return for spent oxide was often a poor one and with increased supplies of sulphur becoming available from Lacq, the export position was unlikely to improve.

Exeter Organic Sulphur Extraction Plant is First of Many

A ROUND-UP of work completed and in progress in the area gas boards is included in the annual report and show that a great many carburetted water gas plants have been or are being adapted to use light petroleum distillate.

For the *Scottish Board* it is stated that the first stage of construction of the Lurgi plant at Westfield should be completed towards the end of 1960 or early in 1961; a number of by-product plants have been completed.

Northern Board. The Segas oil gasification plant at Darlington, including electrostatic detarrer and steam raising plant, is in commission.

North-Western Board. A system of liquid purification of gas by which sulphur is eventually removed by filtration has been operated on a small scale at Whitchurch and in a large-scale plant at Manchester. Completion of negotiations for the supply of refinery gas from Shell Stanlow necessitates the construction of two Onia-Gegi catlytic reforming plants at Ellesmere Port.

East Midlands Board. Catalytic oil gas plants at Leicester and Dinnington are in production; a site is being prepared for a similar plant at Grimesthorpe. Work has started on the catalytic organic sulphur removal plant at Litchurch. An experimental unit to remove both H_2S and a large proportion of organic sulphur, using a fluid oxide bed, is being erected at Basford, Nottingham. A new benzole extraction plant has been completed at Grimesthorpe and one is under construction at Neepsend.

Wales Board. Installation of the Gastechnik purification plant at Port Talbot has been completed. Purification plant capacity at Newport and Shotton is being raised.

North Thames Board. Increased supplies of refinery gas were received from Shellhaven and deliveries from Mobil's Coryton refinery started. Most refinery gas was processed at Romford, but some went to Beckton for cold enrichment of water gas or for the production of a mixture of refinery gas and air.

South Eastern Board. Feedstock of the Isle of Grain Segas plants has been changed from light distillate to heavy fuel oil and refinery gas. Second stage of construction should by now have raised capacity to 45 million cu. ft./day.

Southern Board. Southampton plant for the pre-purification of refinery has started work and refinery gas supplied to the Onia-Gegi catalytic oil gas plants is pre-purified, giving a substantial output increase. Gastechnik and associated sulphur extraction plants at Reading are in operation.

South Western Board. The Exeter organic sulphur extraction plant, commissioned during the period, will be the first of several others.

Letter to the Editor

Demineralised Water in Transistor Manufacture

SIR,—On page 505 of your issue of 24 September 1960 there is a claim that an American demineralising plant has been developed with a guaranteed water quality of 10 million ohms or better. It is stated that the achievement of this quality water on a production basis is believed to be unique.

We would like to comment on this statement in so far as this company has supplied several demineralising plants for transistor manufacturers, all giving water of this quality or better, and we would cite the case of a large industrial plant which has been operating for 2½ years and giving consistently an output water with a resistance of 20 million ohms.

We felt we ought to draw this matter to your attention.

Yours, etc.,
E. I. AKEROYD,
Director

The Permutit Company Ltd.,
London W.4.

De Beers to Make Synthetic Diamonds

LARGE-SCALE production of synthetic diamond grit in South Africa is to be started by De Beers. This was stated in London last week by Mr. Harry Oppenheimer, chairman of Anglo American and De Beers. This decision follows the closing down of the Congo diamond mines, which produced over 90% of the world's supply of crushing boart, which is used for the production of industrial diamonds.

Stocks of crushing boart would last until the middle of next year, when it was hoped that conditions in the Congo would have returned to normal. De Beers felt it necessary, however, to safeguard the market's supplies, should output of natural industrial diamonds still be impeded. If necessary the new plant could be in full production before existing stocks are exhausted.

Q.V.F. to Make Industrial Glassware in Germany

Q.V.F. ARE to build a factory to manufacture industrial glassware, in West Germany, traditional home of the European glass industry. This new £100,000 factory employing a staff of 50 is to be sited at Wiesbaden, for manufacture and warehousing of Q.V.F. chemical glass plant.

Q.V.F. Glastechnik, German subsidiary of Q.V.F. Ltd., Stoke-on-Trent, has "grown tremendously," according to Mr. J. G. Window, sales director. Existing premises in Biebric, Wiesbaden, are "bursting at the seams." A new factory is the only way to ensure that production keeps pace with sales expansion, said Mr. Window.

Ethylene-propylene Copolmers Produce Good All-round Elastomers, Says Natta

ETHEYLENE-PROPYLENE copolymers are particularly suitable for the production of general-purpose elastomers with excellent properties. Evidence for this statement, as well as the description of various cross-linking methods for these copolymers and of the properties of the resultant vulcanised products form the body of a paper presented to the Berlin congress of the Deutsche Kautschuk-Gesellschaft (German Rubber Society) from 4 to 8 October. Entitled 'Rubber-elastic properties of ethylene-propylene copolymers, it was given by Giulio Natta, Giovanni Crespi and Mario Bruzzone, of the Instituto Chemica Industriale, Milan.

New polymerisation processes in the field of fully-saturated or predominantly-saturated elastomers, states the paper, have led to the production of linear head-and-tail-linked high-polymers from α-olefins such as propylene, butene-1 and hexene-1. These high-polymers, with a high degree of regularity in their chemical structure but spatial irregularities, may be converted into elastomers by a cross-linking process. The dynamic properties of elastomers obtained from pure homopolymers, however, are not particularly advantageous, since their secondary transition temperature is high and since their main chains possess only a limited flexibility due to the spatial hindrance of the rotation of the C-C bond round the main chain by the numerous side groups.

Ethylene and α-Olefins Copolymers

Copolymers of ethylene and α-olefins, on the other hand, with their small number of side groups and the opportunity they offer to work with a secondary transition temperature dependent on composition and situated between those of the two homopolymers, can be used for the production of elastomers with excellent mechanical and dynamic properties and good resistance to chemical agents and degradation media. A detailed study undertaken by the authors into the viscous-elastic properties of the copolymers and reported on in the paper proves the suitability of the copolymers for elastomer production. A problem connected with the ethylene-propylene copolymers, however, is that of vulcanisation, since in consideration of the predominantly saturated character traditional vulcanisation methods for unsaturated polymers can obviously not be used. A number of interlacing processes was therefore studied and developed by the authors for this vulcanisation and the resultant properties noted. A summary of these methods and products follows:

Crosslinking of Sulphochlorinated Ethylene-propylene Copolymers. Interlacing after primary sulphochlorination, a process well known for the treatment of polythene, was carried out on the above copolymers with the introduction of considerable alterations to the sulphochlorination process. Chlorine, introduced to the copolymer to a share of 25 to 30 weight% was reduced to a minimum of 2 to 3 weight% during simultaneous introduction of a number of chlorosulphonic groups. Vulcanisation products with high ultimate tensile strength can be obtained—also without use of the usual active fillers—by the formation by the chains' sulphone groups of salts with oxides from polyvalent metals. This vulcanisation process can also take place, as in the case of sulphochlorinated polythene, with the use of organic compounds acting as active biradicals (e.g. chinone compounds) in the presence of radical inhibitors or with organic compounds with more than one salt-forming function in the place of the metal oxides mentioned above. The two vulcanisation systems may be used together, in which case they sometimes have a synergistic effect. Experiments made with metal oxides and thiourea showed that vulcanisates on the basis of the latter's use had the poorer mechanical properties.

Crosslinking with Radical Initiators and Unsaturated Acid Compounds. Since crosslinking with organic peroxide alone is not fully satisfactory, the addition of certain unsaturated compounds was used to regulate the vulcanising effect of the radical initiator, thus producing homogenous vulcanisates and a better crosslinking yield. Maleic anhydride and maleic acid are most effective here, particularly the former combined with benzoyl peroxide. Mechanical properties, as well as the degree of crosslinking, are hereby improved, the former even more if small quantities of zinc oxide are added.

Dicarboxylic Acid

Croslinking of Copolymers Containing Grafted and Saturated Dicarboxylic Acids. Since the improvement in mechanical properties brought about by the addition of zinc oxide mentioned above is probably conditioned by salts formation of the dicarboxylic acid grafted on the copolymer chain, it was attempted to graft the dicarboxylic acid on the copolymer as a separate process and then to carry out a vulcanisation of the graft-copolymer by addition of metal oxide alone. Organic peroxide used decomposes completely in a graft process carried out at temperatures of 180-220°C and a reaction time of under 60 minutes, the graft copolymer produced being easily interlaced with small quantities (2.5 to 5 weight %) of zinc oxide, with the addition of an acidic vulcanisation inhibitor to avoid anvulcanisation through an overquick interlacing process. Used in the initial graft process are only 0.6 weight % di-*tert*butyl peroxide and 3 weight % maleic acid. Very good mechanical properties are obtained by the addition of acidic reinforcing fillers to the graft copolymer. These vulcanisates also have a high age resistance.

Crosslinking by Means of Monomers. Good results were obtained from a crosslinking method employing monomers capable of being polymerised plus small quantities of organic peroxides for treatment of the ethylene-propylene copolymer. Monomers used included styrene, divinyl benzole and acrylic acid. They played a useful role as softening agent before the crosslinking and acted as active filler after vulcanisation. No active fillers were found to be necessary for the obtaining of high tear resistance in the vulcanisate, while hydrocarbon monomers yielded a vulcanisate with very good electrical properties.

Crosslinking of Polymers after Primary Halogenation. Crosslinking may also be carried through after initial chlorination of the copolymers, as in the Italian patent 571.587 of E.I. Du Pont de Nemours and Co. Chlorine content of the copolymers must be high enough to permit complete vulcanisation but not so high as to have a negative effect on the dynamic and age-resistant properties of the vulcanisate. Testing copolymers with a chlorine content by weight of from 5 to 20% and processed to a vulcanisation system involving sulphur, an accelerant (tetramethyl - thiuramdisulphide, 2-mercapto-benzothiazol etc.), zinc oxide and stearic acid, plus if required normal reinforcing fillers, an increase in the modulus of the vulcanisate was observed as chlorine content of the copolymer rose.

Dynamic Properties

Dynamic properties of the polymers show a considerable temperature dependence, even at temperatures above 0°C, the copolymers with the higher chlorine contents (15 to 20%) showing better dynamic characteristics at temperatures of over about 40°C. A quick vulcanisation is observed if brominated copolymers instead of chlorinated copolymers are used and zinc oxide employed alone for the vulcanisation.

Crosslinking of Polymers, Consisting Mainly of Ethylene and Propylene Monomer Units and Containing Unsaturated Elements. Vulcanisation of these polymers was carried out with the normal vulcanisation mixtures for elastomer types containing double bonds. Should the content of double bonds be low in the elastomers, their resistance to degradation agents is practically similar to that of known elastomer types with low double-bond content, while their dynamic properties are excellent and similar to those of known elastomer with a high double-bond content. Interesting mechanical and elastic properties result in the vulcanisate if the double bonds are distributed homogenously enough. Tear resistance is not very good, but can be improved, as can the modulus, by the addition of a filler.

Minister Opens Garton's Glucose and Starch Factory

AS part of a long-term development and modernisation scheme, a new £1 million factory has been built for Garton Sons and Co. Ltd., manufacturers of glucose, starches and by-products and a member of the Manbré group, by Bovis Ltd. The factory was formally opened on Monday, 10 October at Battersea, London S.W.11, by the Parliamentary Secretary of the Ministry of Agriculture, Fisheries and Food, Mr. Joseph Godber.

The new plant, which will double production, is the first stage of a development which will eventually incorporate the whole factory. Old buildings will gradually be pulled down and replaced. This first stage includes the steeping vats in which the maize is prepared for breaking down into its basic constituents—starch, gluten, germ and fibre, the mill house for grinding, and a completely new method of separation, in which the starch is freed from fibre. This machinery is the first of its kind in the country and greatly speeds up the process of preparing starch for the production of glucose. With the plant running at full capacity, some 2,000 tons of starch per week, its output would completely swamp the older part of the factory where the glucose is refined. However, modifications are under way in the old factory which will enable the new plant to run at 75% capacity until phase 2 of the development is in operation with phase 1, in about 18 months' time.

Some interesting features have been incorporated in the factory. Previously, cast iron pipes have been used in this type of application, which involves carrying a suspension of mildly abrasive solids in SO_2 liquor at a pressure of about 50 lb. and at temperatures reaching 140°F. Under such conditions cast iron piping needs constant and costly maintenance. Tests under working conditions showed that Durapipe K. A.B.S. polymer could be used successfully for these processing pipelines, and it has been installed in the new factory. Due to the presence of small amounts of sulphur dioxide gas in the atmosphere the whole of the exposed concrete is painted with a chlorinated rubber finish and all electrical conduiting is p.v.c. coated.

Nothing of the maize, imported from all parts of the world, is wasted in the process. The solution from the steeping vats, in which the gluten is dissolved, known as corn steep liquor, is evaporated and used in the pharmaceutical industry as a medium for antibiotics. The fibre is used in the manufacture of cattle food and crude oil is extracted from the germ and sold to the oil companies.

N.C.L. Develop New Resins to Recover Gold from Cyanide Liquors

FURTHER work at the National Chemical Laboratory, Teddington, on the recovery of gold from cyanide liquors, has now made possible the preparation of a series of much-improved ion-exchange resins. This is stated in the October *Bulletin* of the National Research and Development Corporation, an organisation which has supported the N.C.L. work for three years.

The new resins have been tested by passing a solution simulating a highly contaminated cyanide liquor through columns of resins which were then analysed for the absorbed metals. The liquor contained in parts per million: gold 6, nickel 40, copper 30, iron 24, and thiocyanate 96. A sample of the latest improved resin absorbed 67 troy oz. of gold per cu. ft. compared with 8.7 troy oz. by a previously developed resin.

The gold can be eluted and recovered from the resin by an aqueous solution of sodium thiocyanate which is passed continuously through a cycle containing the resin column and an electrolytic plating cell. Gold recovered is in a high state of purity.

The *N.R.D.C. Bulletin* gives details of inventions available under licence. These include 'Vibrating ball mill', developed by Rose and Sullivan, King's College, London, which makes feasible overall efficiencies of six between 65 and 75%, and which shows substantial improvement over many types of mill.

'Magnetic stirrer', was invented by F D. Stott, Medical Research Council, who sought an improved form of magnetic stirrer that imparted both horizontal and vertical displacements to the liquid, thus promoting more efficient stirring.

'Zirconia from Zircon', invented by Dr. A. R. Burkin, Imperial College, is a method for the treatment of zircon flour, of empirical formula $ZrSiO_4$, so as to remove selectively the elements of silica and leave substantially purified zirconium oxide.

Other inventions include: 'Surface treatment of titanium', invented by Shreir and Piggott, Battersea College of Technology; 'Treatment of columnite', invented by Burkin, Imperial College; and 'Aminovinylquinones', new compounds which could provide versatile intermediates for the synthesis of pharmaceuticals, dyestuffs or photochemicals.

Sheppy Glue's New Fertiliser Plant

In the exclusive CHEMICAL AGE description of the new fertiliser plant at Queenborough, Kent, of Sheppy Glue and Chemical Works Ltd. that appeared in our chemical plant issue of 24 September, p. 506, the word 'General' was inadvertently used instead of 'Chemical' in the company's title

"Drugs Rushed on Market with Little Testing"

EXCESSIVE claims for drugs had been made because of the intense competition between manufacturers, declared Dr. W. Sargant, physician-in-charge of the Department of Psychological Medicine, St. Thomas's Hospital, when he addressed a recent clinical meeting of the British Medical Association, held in Middlesbrough. He claimed that different firms were trying to get their own products on the market—some of them being very little different from those already being used.

"Quite foolish and absurd claims are being made for the use of some of the drugs in quite the wrong type of patient." This added chaos to present confusion about the real value of drugs. At St. Thomas's they had been able to test some of the drugs in advance of their general use, but many were being rushed on the market with little preliminary testing.

Driver Overcome by Bromide Spillage

A LORRY driver, overcome by bromine fumes, was saved by the prompt action of his driver companion at North Queen's Dock, Liverpool, on 6 October. The two men were loading wooden cases containing bottles of bromine when fumes escaped from one case. His companion rushed to the nearest telephone and called the fire brigade. The brigade cleared the area and broke open the case. It contained four bottles of bromine, and the cork of one bottle had fallen out allowing the chemical to overspill. Wearing breathing apparatus and rubber clothing the firemen swilled the bromine into the dock.

The consignment had been brought in by the s.s. *Myra* from Israel where it had been produced by the Dead Sea Works. Consignments arrive in Liverpool about every six weeks.

New Exhibitors at 1961 O.C.C.A. Show

Ten firms who have not shown at previous exhibitions will be among participants at the 1961 Technical Exhibition of the Oil and Colour Chemists' Association. These are: CIBA Clayton Ltd., Joseph Crosfield and Sons Ltd., Fatoils Ltd., Ferranti Ltd., N. R. Fisk, Hoechst Chemicals Ltd., Kunstharsfabriek Synthese N.V., Lehmann Maschinenfabrik, GmbH, Montecatini, and Schenectady-Midland Ltd., the recently formed U.K.-U.S. company in which Midland Tar Distillers Ltd. have an interest.

Dallow-Lambert Open Leicester Research Block

The new research and development block, opened by Dallow Lambert and Co. Ltd., at Thurmaston, Leicester, is devoted exclusively to the improvement of existing designs of the company's dust control equipment and to the development of new ideas. The self-contained unit is additional to the existing laboratory and demonstration departments.

SIMULATION OF CHEMICAL PLANT

Benefits of Programming with an Electronic Computer

By Dr. P. V. Youle

(I.C.I. Fibres Division)*

'Simulation,' especially by an electronic computer, has been claimed as a useful way of increasing knowledge about a chemical plant, so providing a useful guide to improving plant performance. In this article these claims are examined and an attempt made to justify them

IN its broadest sense, 'simulation' means model-making. From this point of view, therefore, a semi-technical plant would be a 'simulation' of the full-scale plant. The cost of operating such plants is often high and this expense has led to the recent growth of interest in a narrower definition of simulation, in which the models are, inexpensively, worked out on paper.

A very simple plant, consisting of no more than, say, the simplest form of continuous reactor, may have its behaviour adequately expressed by a mathematical equation. The behaviour of the equation may then be well enough expressed, perhaps, by a family of graphs. If this can be done satisfactorily there is certainly no need to employ an electronic computer. An electronic computer may, however, be a great help, and even a necessity, if the plant is complicated. Simulation in the chemical industry would therefore be defined as the construction of a mathematical or graphical or computer model of a chemical plant.

Simulation for New Projects. Two different sets of circumstances will benefit from a simulation exercise. In the first, a firm has just decided that a certain development should be carried forward to the full scale. Research, development and production staff might divide the progress of this job into the following five parts:

(1) Laboratory work.
(2) Semi-technical plant design.
(3) Semi-technical plant operation.
(4) Full-scale plant design.
(5) Full-scale plant operation.

The firm might run into a difficulty in transferring information between the teams engaged on these separate tasks, and also might find, even at the full-scale plant design stage, an insufficiency of data. The idea of simulation can help with these difficulties.

The simulation of the full-scale plant is used as a master plan throughout all the five stages. It begins rudimentary, but is gradually made more complete until, before ever the full scale plant is actually built, start-up troubles are being sorted out by running the model plant, if necessary on an electronic computer.

Simulation for Existing Plants. This is the second and probably more general use of simulation. Here, the management is interested in a particular product, either to increase output from a given plant, or, at constant output, to improve quality and efficiency.

The shift-teams on the product plant will, most probably, have co-operated in a piece of work study to determine optimum manning of the plant and perhaps to devise an incentive scheme. This study will have been done, objectively, by studying what jobs the shift teams actually perform, then by studying alternative ways of organising the jobs.

Management would start to simulate its product plant by asking a team to study the plant in the same objective way. They would study all aspects of the plant. Not just the reactor would be studied, but the flow and storage of raw materials and products. The real control points in the product-making sequence would be observed (and may well prove surprisingly different from those supposedly in operation). This objective study might be termed a piece of operations research or of method study.

Simulation makes it easier to use the results of this plant study. The co-operation of plant staff has been obtained, a line diagram of the plant has been drawn out and the plant behaviour has been plotted. Then, if the plant is at all complicated, time will be saved by making the model on an electronic computer. Digital machines are very convenient for this purpose, and time, as well as advice, may be hired, surprisingly cheaply, from various commercial firms as well as university departments. The computer, by being completely stupid, requires everything to be set down, in full detail, and thus disciplines the team doing the plant study; they have to find out everything about the plant.

The basis for the computer programme is a full logical analysis of the plant, and of the way material is transferred from stage to stage. Computing may be done in whatever way is easiest for the particular computer. Many forms of automatic programming nowadays enable chemists and engineers to set up their own results with great facility.

An analysis of plant record sheets will now disclose the average cycle times for each stage and also will give information about the variability of these times. The computer will then generate similar sets of times and will run through a typical week's production in, say, less than five minutes. It will print out the results in any form acceptable to plant management.

A close comparison between calculated and observed plant performance will confirm that nothing important has been missed in the plant study. The computer programme can then be accepted as an accurate model of the plant, and a stream of interesting results begins to flow.

Benefits from Simulation. The computer programme, prepared as described above, will now carry out the necessary calculations to show where are the plant bottlenecks. In July, plant output may have been higher than in June; the computer will compare the two months' figures to determine the contributions made by reductions in some cycle times and by reduced variability in others. It can also be programmed to give plant management a reasoned plan for obtaining a further increase in August. If there seems a shortage of capacity at a certain stage, the computer will calculate the output to be expected if an extra unit is added at that stage. And, of course, if any new systems of plant control are being considered, they can be tried out on the model and many troubles be averted before real-life trials begin.

A scheme of plant study such as this need not be costly. Often, individuals on the plant will be found already carrying out relevant but only partial investigations. With slightly more manpower and some computer advice, the partial investigations will flow together, to reveal clearly just what are the points of strength and weakness in the succession of pipes and vessels which constitute that particular plant.

* Dr. Youle has now transferred to I.C.I. (Heavy Organic Chemicals) Ltd.

Dropping Test for 50-gall. Polythene Drum

Testing corrosion-resistant 50 gall. drum by dropping it from a lorry. These drums are made by Fireproof Tanks Ltd. from rayon, coated and impregnated with British Geon's Hycar nitrile rubber. They can easily be folded when not in use. Owing to an error in transmission, this drum was incorrectly illustrated in 'Chemical Age,' 27 August, p. 323

CHEMICAL INDUSTRY MAY PAY MORE FOR WATER—DROUGHT LESSON OF I.C.I. BILLINGHAM

A WARNING that British industrialists will soon have to choose between paying more for their water supplies and exercising strict economy in their use of water was given by Mr. C. H. Spens, chief engineer to the Ministry of Housing, when he opened a new reservoir at Selset, in upper Teesdale, recently. Supplying the large quantities of water required by industry would involve public water undertakings in much capital expenditure, which meant increased charges to the consumer. Industries might have to devise ways of re-using water so that they do not have to take so much from public undertakings.

As a large user of water for steam raising, process purposes, cooling and other duties, the chemical industry is as much affected as any by this situation, and it seems appropriate that Selset, where this warning was given, is not far from the Billingham (Co. Durham) complex of Imperial Chemical Industries Ltd., which was severely affected by the 1959 drought. Billingham's normal consumption in 1959 was about 7 million gall./day of town water, about 3.5 m. gall./day of medium-quality water from local streams and boreholes, and 230 million gall./day of estuarine water. It had always been necessary to plan for further large-scale economies in times of drought and to make estimates of their cost; an opportunity to put these plans into practice arose in the late summer of 1959.

Water Economy at Billingham

In a paper presented to the Institution of Civil Engineers in London on 4 October, J. A. Cooper, B.Sc., Ph.D., design chemist, and L. G. Smith, M.I.C.E., design engineer for water and drainage, both of Billingham Division, described how water economy was put into practice at Billingham. Savings of at least 10% were obtained by asking for consumption to be restricted—even in those uses where water is normally used freely to avoid losses and damage out of all proportion to the cost of water. Economy was also practised in the use of water for the absorption of the last traces of useful gas from atmospheric effluent. Water for amenities such as lavatories and wash basins was also reduced to a minimum, the steam supply for space heating was isolated, while the use of clean water for cleaning roof glazing, plants and vehicles was forbidden.

The total dissolved solids content of the water in the main boilers was reluctantly increased to 2,000 p.p.m. (1,500 p.p.m. normal) and that in the main waste heat boilers to 3,000 p.p.m. (2,000 p.p.m. normal). It was later found that a number of superheater tubes had been damaged by carry-over of saline boiler water in steam; this damage may have been a result of the increase in T.D.S. content.

Strenuous efforts were made to increase the quantity of condensate returned to the boiler plant and a 10% increase was achieved. Relatively clean water used for washing finished products from one plant was re-used in another plant as cooling water make-up. Badly contaminated condensate, normally sent to drain, was diverted to cooling towers as make-up water. A further modest saving was achieved by increasing the concentration of ammonia liquor made in the factory.

Methods of running plant on lower-quality water were also introduced, while supplies of clean water were augmented by pumping from a large local pond and colliery, by sinking 12-in. boreholes to 500 ft. in a fortnight, and by pumping water across country in plastics pipelines.

Towards the end of the year the water supply position improved, and by late November full consumption was permitted, but even in late December the rate of consumption was below that earlier in the year. Apparently some of the reduction was permanent and there had been a limited change to inferior sources of water. Experiences after previous droughts have shown, however, that after several months the effects of increased atmospheric pollution, corrosion, scaling, and loss of product, etc., are so undesirable or expensive that it is necessary to revert to normal water consumption. It thus seems impracticable to limit permanently consumption of either factory or domestic water and the provision of ample supplies of water appears to be the only lasting solution.

Encourage Small Firms to Export, Urges C.B.M.P.E. Chairman

CONCLUSION of a further contract from Petroleos Mexicanos (Pemex), involving some £3½ million worth of credits, was reported to be in the final stages by Mr. J. M. Storey, C.B.E., chairman of the Council of British Manufacturers of Petroleum Equipment, at the C.B.M.P.E. annual dinner in London on 5 October. This second contract was a follow-up to another of the same value, both being obtained through the British Oil Equipment Credit Co., the recently formed subsidiary of the C.B.M.P.E. Pemex is the only customer of this company so far. The first contract has already been placed with C.B.M.P.E. members and "considerable shipments have already been effected". Mr. Storey thought the C.B.M.P.E. could claim to be the first council or association in this country to have made such facilities available to its members.

On the subject of exports, Mr. Storey referred to increasingly tough Continental competition "and I am sure we would all like to know what H.M. Government is going to do about it". The Export Credits Guarantee Department (E.C.G.D.) was an organisation whose functions, he pointed out, were difficult to understand. The nations of the world were living more and more on long-term credits, and a new approach had to be made to long-term credit facilities, such that the small firms handling relatively small contracts can be encouraged to get into the export business and thus swell the ultimate total. "Terms must be arranged to enable us all to compete in the long-term credit facilities market."

A further point made by Mr. Storey was that, some years ago it was considered prudent to form the Dollar Export Council to attack the dollar markets. Undoubtedly the Council had been successful; why not investigate the possibility of forming other councils to attack other specialised markets?

Chief guest at the dinner was Sir John Wrightson, Bt., T.D., chairman of Head Wrightson and Co. Ltd., who paid tribute to the excellent work done by the C.B.M.P.E. executive committee in setting up B.O.E.C. But he warned members against imagining that long-term credit terms, with the indiscriminate granting of facilities to all and sundry, could be a panacea.

Official guests at the dinner, which was attended by nearly 1,500 members and guests, included Mr. N. Fraser, chairman, British Chemical Plant Manufacturers' Association; Mr. E. Le Q. Herbert, president, Royal Institute of Chemistry; Mr. R. Maudling, President of the Board of Trade; and many other distinguished personalities from home and overseas.

Strontium 90 in Diet Well Below Permitted Level

THIRD report of the Agricultural Research Council's series dealing with its surveys on the contamination of human diet in this country by strontium 90 from fall-out has been published by H.M.S.O., price 3s 6d.

It was estimated that the mean ratio of strontium 90 to calcium in the average diet of the whole population in the U.K. was 9.0 micro microcuries per gr. and that it did not exceed 15 micro microcuries per gr. in any large section of the population. Because of the relatively high levels of contamination early in the year these values are about 50% higher than those estimated for 1958. The estimated level in the diet of the population as a whole, however, represents less than 1/20 of the maximum permissible level recommended by the Medical Research Council.

Overseas News

ELECTRIC ARC HEATER WILL INDUCE DIFFICULT CHEMICAL REACTIONS

HIGH-ENERGY electric arc heater with the potential capability of supplying a stream of gas at temperatures as high as 20,000°F and pressures as great as 15,000 p.s.i., which the makers expect to find applications in the chemical industry as a synthesiser, has been developed by the U.S. firm, Westinghouse Electric International Co. As a chemical synthesiser, the machine will supply the high temperatures necessary for inducing difficult chemical reactions. Nitrogen and oxygen, for instance, could be combined in the heat chamber to form nitrous oxide, and a synthesiser of this type, say Westinghouse, could also find application in processing petroleum products.

In all applications, the success of the arc heater is greatly dependent upon a low level of contamination. One of the problems involved in units under development in the past two years is that electrodes and walls of the chamber burn and thus contribute impurities amounting to as much as 10% of the mass of the gas flowing through the system. The Westinghouse unit has a guaranteed maximum contamination level of 0.2% and still further reductions in this level are contemplated.

A key to the performance of the new machine lies in the design of the two electrodes which form the terminals for the arc. They each consist of a hollow, doughnut-shaped ring placed horizontally, one directly above the other. Water is pumped through the rings for cooling.

B.A.S.F. Order Automatic Plant from U.S.

Badische Anilin- und Soda-Fabrik AG, Ludwigshafen-on-Rhine, have placed an order for a complete automatic plant for a chemical works with the Los Angeles company of Thompson Ramo Wooldridge.

Chinese P.V.C. Plant Under Construction

A plant is stated to be under construction near Pekin for the annual production of 40,000 tonnes of p.v.c.

Yugoslavia Starts Production of Calcium Carbide, Oxygen, etc.

The Yugoslav State company Jugohrom has started production of calcium cyanamide and calcium carbide at its Tetovo and Jegunovci plants. Total production for this year will amount to 28,000 tonnes and in 1961 to 44,000 tonnes. The country's Ruze nitrogen works is to increase silicon carbide output by 750 tonnes, thus making Yugoslavia independent of imports. Natural gas from the local Struzec and Klostar fields will be used as base material for a plastics plant under construction at Zagreb, which is due to come into operation in 1963 with 15,000 tonnes a year of polystyrene and polythene.

The Jugomoutaza chemical concern of Zapresic, Yugoslavia, have started the production of oxygen at an initial hourly rate of 30 c.m. By the end of 1960 the installation of modern imported plant will have raised output to 200 c.m./hour.

More Soviet Natural Gas for Poland

An agreement was recently signed in Moscow, between the U.S.S.R. and Poland, on increasing the supply of Soviet natural gas to the latter. The U.S.S.R. will build a pipeline from the Western Ukraine to the Polish frontier. Poland will provide the necessary steel pipe. The gas will be used as a raw material for the development of the chemical industry and as fuel in other Polish industries.

Ultra-pure Water Produced in U.S.

A system which achieves the presently-recognised theoretical ultimate of water purity on a production scale without the use of heat has been developed by Bogue Electric Manufacturing Co., U.S. It is claimed that, by the use of this system, water containing less than one part of solids per 1,000 million has been mass produced without employing distillation or any other method that requires heat-producing equipment. The system, based on ion-exchange, is producing 100 gall. of water per minute with a resistance of 24 million ohm per c.c. at 18°C at a major semiconductor plant.

Organic Chemicals Imports Quotas Relaxed by France

Quota restrictions on organic chemicals, plastics materials, etc., have been eased by the French Government, to raise the proportion of quota-free imports from O.E.E.C. and dollar areas from 91% to 92.5%. Within the next six months further liberalisation moves are expected to raise this level to 95.7%.

Ionics Have Light-weight Fuel Cell for Powering Space Satellites

A light weight fuel cell which can be used to generate electric power in satellites and space vehicles and can be recharged by solar radiation has been developed by Ionics, Inc., Cambridge, Mass. Operating on hydrogen gas and a solution of common chemicals, bromine and water, the cell has demonstrated unusual electric generating capabilities which make it suitable for powering instruments, life support equipment, communications facilities, lighting and other apparatus required for manned satellites and 'vehicles' travelling in space. It can be recharged using solar cells, while a satellite is on the sunny side of the earth, and then supply necessary electric power while the satellite is in the shadow of the earth.

This cell is particularly attractive for space applications, because of the high power density obtainable when it discharges and because of the low voltages required from the solar cells used for recharging. Special plastics ion exchange membranes developed by Ionics are a key part of the cell design which make possible the cell's superior performance.

Japanese Experts Re-plan Argentina Sulphur Mine

According to experts from a Japanese company which has been granted the contract for re-planning and modernising the Casualidad sulphur mine in Salta, Argentina, the mine's production could be increased by 66% to 30,000 tons/year.

Houdry Name 12 Foreign Distributors for Dabco

To increase and strengthen world-wide marketing of Dabco, triethylenediamine one-shot catalyst for producing urethane foam, Houdry Process Corporation have appointed sales representatives for 12 additional foreign countries. The countries are Sweden, Finland, Norway, Denmark, Spain, Portugal, Italy, France, Switzerland, Mexico, India and Australia. Houdry had previously appointed Lindeteves-Jacoberg Ltd. to sell Dabco in Benelux and South Africa, Jacobson Van Der Berg (U.K.) Ltd. in the U.K., and Nissho Ltd. in Japan.

U.S. Dyestuffs Plant for El Salvador

A dyestuffs plant has been erected in the central American state of El Salvador by Sherwin Williams Central America S.A., a subsidiary of U.S. Sherwin Williams group. Cost of the plant is put at $1 million.

Fire at Dow's Polyolefin Plant

Following a fire that caused damage estimated at $100,000, part of the polyolefin plant at Bay City, Mich., of Dow Chemical will be out of capacity for a few months. The fire occurred in the reactor area of the polythene plant.

B.A.S.F. Investment Spending will Total DM600 Million

Because of the two year time-lag between the planning of an investment and the date when it begins to bear interest, Badische Anilin- und Soda-Fabrik have decided on total investments of about DM600 million to be distributed among many hundreds of separate projects. Of this capital investment 75% will go on production plants, including energy, 15% on research and application techniques and 10% on workshops, overhead pipelines, gas pipes, transport and

welfare institutes. Expansion programme emphasis is on plastics, including allied products such as plasticisers and intermediates; this will account for about 60-65% of expenditure on plant. B.A.S.F.'s big output of synthesis gas is currently based 60% on coal and coke. This basis will largely be maintained, but the planned increase will utilise petrochemical processes.

Tidewater-Collier to Double Naphthalene Capacity

Initial naphthalene output at the proposed plant of Tidewater Oil and Collier Carbon and Chemical (CHEMICAL AGE, 2 July, p. 251) is to be doubled from 50 million to 100 million lb./year. The increase is prompted by the growing market for high-purity, petroleum-based naphthalene. Site for the plant is at Tidewater Oil's refinery near Wilmington. The two companies are also actively considering a joint naphthalene plant in the Los Angeles area.

Ethanol and Methanol From Oswiecim

Production of ethanol and methanol is to start at the Oswiecim chemical combine in Poland before the end of the current year. Output will be such as to eliminate present methanol imports which are running at some 6,000 tonnes/year.

Neomycin Incorporated in New Polio Vaccine

A new injectable polio vaccine of killed virus, claimed to be more effective and purer than the Salk vaccine, is now on sale in U.S. It contains almost no trace of the monkey tissue culture and incorporates neomycin instead of penicillin of streptomycin. The new vaccine costs three times as much as the Salk but is more concentrated. It is unlikely that it will be produced in U.K. as, at present, interest of both doctors and manufacturers is concentrated on the live oral vaccine which is undergoing trials.

Tennessee-Eastman to Open Swiss Research Centre

Another U.S. chemical firm has announced its intention of setting up a research centre in Switzerland. Tennessee-Eastman have created a new Swiss company, Eastman Research AG, with offices and laboratories in Zurich ready for occupation in the early spring of 1961. European scientists will be engaged to conduct research programmes independent of those pursued in the U.S., with the accent mainly on basic research in polymer chemistry and physics, catalysis and in synthetic organic chemistry.

Large Alkalis Expansion Under Way in Brazil

A plant under construction at Cabo Frio in the Brazilian State of Rio de Janeiro by the Fabrica Nacionale de Alcalis is to produce annually 20,000 tonnes of caustic soda by the Solvay process, 72,000 tonnes of sodium carbonate, 80,000 tonnes of lime, 22,000 tonnes of gypsum, 8,000 tonnes of magnesium oxide and 27,000 tonnes of calcium carbonate. A part of the works already completed is now engaged in the daily production of 180 tonnes of sodium carbonate. With the aid of this plant Brazil will save U.S.$20 million a year in alkali imports. More chemical plants are expected to be constructed in the neighbourhood of the Cabo Frio works.

Second Urea Producer for West Germany

Union Rheinische Braunkohlen Kraftstoff AG, The Wesseling, West Germany, have opened at their plant near Cologne a unit for the annual production of 25,000 tonnes of urea. The urea will be manufactured by the process developed by the Netherlands Stamicarbon company. There is only one other urea producer in West Germany—the Leverkusen firm of Farbenfabriken Bayer AG.

Montecatini Open New Phthalic Anhydride Plant

A plant for the production of phthalic anhydride, claimed to be the most modern in Europe, has been inaugurated at the ACNA-Montecatini works at Cengio (Bormida Valley), N. Italy. This plant will be able to produce over 10,000 tonnes/year of phthalic anhydride which will be transported to Montecatini's plant at Ferrara in liquid form in special heated road tankers.

Expansion for Italian Synthetic Rubber Plant

By the end of the current year the potential output of Anic's plant at Ravenna will be raised to 90,000 tonnes/year of synthetic rubber and 1 million tonnes of chemical fertilisers according to Mr. E. Mattei, president of the E.N.I. Group.

U.S. Firm to Build Citric Acid Plant in Israel

A $2 million citric acid plant, to be built in Haifa by Miles Chemical of the U.S., will have a 1,500 tonnes/year capacity. Due for completion in 1961, the plant will use the U.S. company's deep fermentation process. About half of the output is earmarked for export.

Tennessee-Eastman Aniline Explosion Kills Eleven

An explosion in the aniline facilities of Tennessee-Eastman at Kingsport, Tenn., killed 11 and injured more than 50. No major disruption of supplies is expected as the explosion did not affect other sections of the plant, parts of which were shut down as a safety measure. Most of the units at Kingsport were operating normally the following day.

Israeli Company to Make Alkaloids and Glucose

A new factory for the production of alkaloids, glucose and plant extracts is to open next month at Natania, Israel, under the name of Plantex. Equipped with its own research laboratory, the plant is being constructed with equipment from the Promotex concern, of Geneva. The plant is stated to have been financed by M. Edmond de Rothschild, of Paris.

Monsanto have Large-scale Styrene Expansion

A new range of styrene-based plastics materials is planned by Monsanto Chemical Co. in a large-scale expansion at their Addyston, Ohio, plant. Their U.S. capacity for heat-resistant and high-impact styrene moulding and extrusion compounds will be increased 25%. The new plant, due to be operating by late 1961, will include integrated polymerisation and compounding facilities.

Methanol Plant Under Construction in Yugoslavia

A unit for the production of methanol is being constructed at the Gorazde factory for Nitric Compounds in Yugoslavia. A carbide plant is also believed to be projected for the same works complex. Capacities have not yet been declared.

Celanese Plan Second U.S. Petrochemical Facilities

Celanese Chemical are to buy a large site near Bay City, Texas, where plant will be erected as a "logical extension of present operations in Texas", which include oxygenated hydrocarbons and polythene. Details about specific products will be announced later.

West German Centrifugal Process for Extracting U-235 from Ore

DEVELOPMENT in Western Germany of a process for extracting fissile Uranium 235 from its ore by centrifugation has been reported. The process is stated to require only about one-tenth the power needed for the gaseous diffusion method.

Three German concerns are connected with the project, one being the Degussa concern, who are stated to have made considerable progress in their research. Work along similar lines is being carried out by the U.S. Atomic Energy Commission. Efforts are being made by the U.S. to co-ordinate security measures and to persuade the West German Government to control German research on the process and to restrict the publication of details. If acquired by other, smaller countries the process might open up possibilities for the economic manufacture of nuclear weapons.

At the Max Planck Institute, Goettingen, centrifuges for uranium ore separation have been built on a laboratory scale, but a large pilot plant is envisaged for the future.

SCIENTIFIC RUSSIAN WITHOUT TEARS

Part 3—Verbs and Simple Sentences

By Professor W. J. Perry

(University of Arizona, Tuscon, Arizona, U.S.)

THE verb in Russian sentences plays much the same role as in English, namely, to indicate action or to designate a condition. Endings are used more extensively than in English and auxiliary verbs are used much less. Russian does not employ such combinations as 'am filtering', 'have been filtering', 'will have filtered', 'will have been filtering'. Instead Russian makes use of parallel sets of verb forms to distinguish between (1) action thought of as incomplete, in progress or frequently repeated (imperfective forms), and (2) action thought of as complete (perfective forms). A prefix is often used to distinguish perfective and imperfective forms as exemplified by the use of с- to convert the imperfective infinitive *фотографировать 'to be photographing' into the perfective infinitive *сфотографировать 'to photograph'.

But before discussing perfective and imperfective forms, it should be noted that assimilation of foreign verbs into Russian seems to pass through two stages. At first, a single infinitive is observed together with various forms readily derived by standard operating procedures. With verbs at this stage, the context is relied upon to distinguish between the action of imperfective and perfective type. Verbs that appear to be at this stage at present may be exemplified as follows:

*активировать	to be activating / to activate
*диазотировать	to be diazotizing / to diazotize
*метилировать	to be methylating / to methylate
*нитровать	to be nitrating / to nitrate
*экстрагировать	to be extracting / to extract

The second stage of assimilation involves affixing a prefix to form the perfective infinitive from which a further set of verb forms is then derived. For example:

*анализировать	*проанализировать
to be analyzing	to analyze
*концентрировать	*сконцентрировать
to be concentrating	to concentrate
*патентовать	*запатентовать
to be patenting	to patent
*публиковать	*опубликовать
to be publishing	to publish
*фильтровать	*профильтровать
to be filtering	to filter
*шифровать	*зашифровать
to be encoding, ciphering	to encode, to cipher

As generally used, such prefixes as про-, за-, о-, с-, and others alter the meaning of a simple imperfective infinitive to which they are attached. Thus, when so used in addition to indicating completed action, про- implies 'through' 'to an end', с- implies either 'with, together' or 'down, off', etc. (See §404, page 483, 'Scientific Russian' (2nd edn.), Interscience Publishers, New York and London.) Thus, *профильтровать may be translated, depending on context, as 'to filter (completely)' or 'to filter through'. With such perfect infinitives, the Russians often introduce an alteration to form a corresponding imperfect infinitive as shown by the following examples:

*фильтровать ——→ *профильтровать
to be filtering
*профильтровывать ←—— to filter (through)
to be filtering through

*кристаллизовать ——→ *выкристаллизовать
to be crystallising
*выкристаллизовывать ←— to crystallise (out)
to be crystallising out

The same relationship between perfective and imperfective infinitives is often to be observed when the prefix results in more or less extensive alteration of the basic meaning, as for example:

*кристаллизовать ——→ *перекристаллизовать
to be crystallising
*перекристаллизовывать ← to recrystallise
to be recrystallising

*магнитить ——→ *намагнитить
to magnetise
*намагничивать ←—— to magnetise
to be magnetising ——→ *размагнитить
*размагничивать
to be demagnetising ←—— to demagnetise

With purely Russian verbs, e.g., лить to be pouring, a considerable variety of related verbs are derived by means of prefixes, e.g., the infinitive pair отливать (imperfective), отлить (perfective) meaning, 'to pour off, to decant, to cast (metal)'. See §43, pages 54-55 and §321, pages 363-365 of 'Scientific Russian'.

The prefix по- is frequently used to form perfective infinitives, for example:

белить	побелить
to be bleaching	to bleach
беречь	поберечь
to be guarding, preserving	to guard, preserve
лечить	полечить
to be curing	to cure
терять	потерять
to be losing	to lose

With some Russian verbs, the perfective and imperfective infinitives differ even less extensively than in previously cited examples. Note for instance:

изменять	изменить	(мена
to be changing	to change	—change)
испарять	испарить	(пар
to be evaporating	to evaporate	—vapor)
облегчать	облегчить	(лёгкий
to be facilitating	to facilitate	—easy)
расширять	расширить	(широкий
to be expanding	to expand	—wide,broad)

Note further similar examples:

исправлять	исправить	(право
to be correcting	to correct	—right)
обезвоживать	обезводить	(вода
to be dehydrating	to dehydrate	—water)
отсыхать	отсохнуть	(сухой
to be drying out	to dry out	—dry)
снижать	снизить	(низкий
to be lowering	to lower	—low)

A few verbs derive their imperfective and perfective infinitives from different roots, for example:

брать to be taking	взять to take
говорить to be speaking	сказать to speak
приходить to be arriving	притти to arrive / придти

Reference has already been made to parallel sets of verb forms derived from imperfective and perfective infinitives. These may be summarised as follows:

Imperfective Infinitive	*Perfective Infinitive*
Present tense (six forms)	(No present tense)
Past tense (four forms)	Past tense (four forms)
Future tense (six forms) (Future tense of быть 'to be' used as auxiliary with infinitive†)	Future tense (six forms)
Imperative (two forms)	Imperative (two forms)
Conditional (Here the past tense forms are used with the particle бы)	Conditional
Participles (four as noted below)	Participles (two as noted below)
(Note—Participles are used mostly as noun modifiers and are declined adjective endings.)	
Present active	Past active
Present passive	
Past active	
Past passive	Past passive
Gerunds (verbal adverbs)	Gerunds (verbal adverbs)
Present active (one form)	Past active (two alternate forms)
Past active (two alternate forms)	

† The only Russian verb that forms a simple imperfective future tense is быть 'to be' and it is used as an auxiliary to form the imperfective future tense of all other Russian verbs.

For a more detailed summary of Russian verb forms, see Chapter 35, pages 362-376, of 'Scientific Russian' (2nd edn.) Some Russian verbs, especially intransitive verbs, do not have all the above forms.

The present tense, third person, singular is formed with -ет or -ит and the corresponding plural with -ут, -ют, -ат or -ят depending on the verb, as in the following sentences. (Nouns in the accusative case are underlined.)

Дерево	горит	сравнительно	быстро.
Wood	burns	relatively	rapidly.
*Металлы	хорошо	проводят	*электричество.
Metals	well	conduct	electricity.
Вязкие	жидкости	текут	медленно.
Viscous	liquids	flow	slowly.
*Металлический	*рубидий	легко	разлагает
Metallic	rubidium	easily	decomposes
воду.	Вода	кипит	при 100°Ц.
water.	Water	boils	at 100°C.

The suffix -ся (or sometimes -сь) may be affixed to transitive verb forms to make them reflexive. The reflexive forms are frequently used to denote the passive in English, or in such a way that an English intransitive corresponds to the Russian reflexive.

*Сталь	широко	применяется.	
Steel	widely	uses self (is used).	
Некоторые	твёрдые	вещества - например	
Certain	solid	substances, for example	
*иод,	*камфора,	*нафталин - сравнительно	
iodine,	camphor,	naphthalene, relatively	
быстро	испаряются.		
rapidly	evaporate self.		
При	охлаждении	многие	жидкости
On	cooling	many	liquids
*кристаллизуются.			
crystallise self.			
Стекло	медленно	*кристаллизуется.	
Glass	slowly	crystallises.	

The present tense of быть 'to be' is obsolete in Russian—at least in the sense that 'am', 'is', 'are' are ordinarily used in English. Thus, we may encounter sentences as the following:

Я	—	*американский	*химик.
I (am)	(an)	American	chemist.
*Металлы	обычно	твёрдые	вещества.
Metals (are)	ordinarily	solid	substances.

Implied verbs in simple sentences are reviewed in detail in Chapter 15, pages 133-142 of 'Scientific Russian' (2nd edn.)

B.S. for Tar Acid Determination

WATER-MISCIBLE solutions and emulsions containing coal-tar acids have been used for disinfectant purposes for many years; the former are generally known as 'black fluids' and the latter as 'white fluids'. Originally the active ingredients were wholly derived from coal tar, but it is now common for them to include similar acids derived from petroleum, and some manufacturers add active ingredients of other types.

To avoid the complications which result from indiscriminate use of the established terms 'black fluids' and 'white fluids' the British Disinfectant Manufacturers' Association has now recommended that these terms should be applied only to fluids containing coal-tar acids, or similar acids derived from petroleum, or mixtures of these. If other active ingredients are also present, the designations 'modified black fluids' and 'modified white fluids' should be used.

These definitions enable a method, developed by the B.D.M.A., to be specified for the determination of tar acids in black and white disinfectant fluids, which is the subject of the new British Standard, B.S.3265. For the application of the method, it is immaterial whether the acids are derived from coal tar or from petroleum, and they are reported as 'tar acids' irrespective of their actual source. The method is not suitable, however, for modified fluids.

Copies of the standard may be obtained from the B.S.I. Sales Branch, 2 Park Street, London, W.1, price 4s 6d (postage extra to non-subscribers).

Organic Compounds for Synthesis

ORGANIC SYNTHESES. Vol. 38. Edited by *John C. Sheehan*. John Wiley, New York, Chapman and Hall, London, 1958. 32s.

Since the publication of the first volume of organic syntheses in 1921, under the editorship of Roger Adams, organic chemicals have become commercially available over a very broad and increasing range. Notwithstanding, the present volume, edited by John C. Sheehan, confirms the view that there will always be preparations of organic compounds which the chemist will like to find worked out in detail, and conveniently available in a handy reference book. Given that a method must have particular merits to justify its inclusion, namely, scope, convenience and perhaps unusual interest, these features will be evident in the present collection of miscellaneous preparations, from which salient examples may be quoted.

The preparation of monovinyl acetylene from 1,3-dichloro-2-butene is clearly one of considerable value, which also illustrates the technique of low temperature fractional distillation on the preparative scale. The inclusion of an alternate method of preparing 1-methyl-*iso*-quinoline from Reissert's compound will be welcomed by many. To select further examples of particular interest one might mention the cyanoethylation of *o*-chloroaniline, which, significantly, is catalysed by cupric acetate; and the preparation of diphenyl acetaldehyde by the isomerisation of stilbene oxide. Several preparations of long-chain aliphatic derivatives are also included.

The reader who is left wondering why so many apparently academic preparations are given will be reassured to know that subsequent volumes in this series will indicate, after each experiment, the reasons for its inclusion. It would appear that the preparative organic chemistry of phosphorus has been neglected in organic syntheses. Current technological developments in the phosphorus field may prompt the editor to correct this situation.

J. H. TURNBULL

Chemistry of the Fibrous Proteins

A course intended to attract qualified people interested in the methods of protein analysis and structural determination and applications of these general methods to the study of fibrous proteins, is to be run by the Bradford Institute of Technology, Bradford 7, on 18 and 19 November.

Short Course on Chemistry of Plastics and Polymers

A special short course on 'Recent developments in plastics and polymer chemistry' will be held at the Bradford Institute of Technology on 28 and 29 October. Fee for the course is £2 5s. Further details are available from The Registrar, Institute of Technology, Bradford 7.

Chemist's Bookshelf

Four Ways of Determining Molecular Structure

THE NATURE OF THE CHEMICAL BOND AND THE STRUCTURE OF MOLECULES AND CRYSTALS: AN INTRODUCTION TO MODERN STRUCTURAL CHEMISTRY. 3rd Edn. By *Linus Pauling*. Cornell Univ. Press, Oxford Univ. Press, 1960. Pp. xx + 644, 193 figs., 85 tables. 60s in U.K.

There are four ways of determining molecular structure. The first is to find out the ways in which the molecule can be synthesised; the second is to study its reactions; the third is to use physical methods, such as spectroscopy, magnetic properties, refractivities and X-ray, electron or neutron diffraction. These are deductive methods, the first two of which are not dealt with here. The fourth method is the comparison of theoretical prediction with experimental facts. The latter applies especially to theories of the nature of the chemical bond, for which an understanding of the electronic structure of atoms is as necessary as that of the chemical structure of molecules.

Molecular structure alone is not sufficient, however, to account for all the properties of any substance. In the solid state especially, it is also important to know the arrangement of molecules relatively to one another, or if the substance is non-molecular, that of the atoms, ions or ionic groups.

This kind of knowledge has increased so much and become so much more precise within the last 20 years, that although the 1940 (2nd) edition of this scientific classic was still in great demand as a student textbook and research worker's manual, yet a new edition was clearly called for. The present volume is almost half as long again. It has a new chapter on the electronic structure of atoms, which while it does not contain anything that the reader is not likely to have learnt elsewhere, does make the treatment more complete for the undergraduate student. More emphasis is now laid on general principles, with numerous examples or calculations to illustrate them, and on detailed discussion of controversial issues. Possibly in a few years' time the author will be able to issue a fourth edition in which numerical information about the dynamics of molecules and crystals is taken into account.

The figures are a delight; they are notable examples of just what book illustrations should be. References are numerous, but they do not clutter up the text, which is very easy to read. There is an excellent table of contents and good indexes. The price is low by all modern standards and indicates that a wide sale is confidently expected. This is surely correct, for libraries will need several copies and many students will find it worth while to possess their own.

KATHLEEN LONSDALE

Kinetics of Unimolecular Reactions

THEORY OF UNIMOLECULAR REACTIONS. By *N. B. Slater*. Methuen and Co. Ltd., London. Pp. 230. 36s net.

In the 40 years since F. A. Lindemann demolished the radiation theory of unimolecular reactions and took the first tentative steps towards a full understanding of the kinetics of such processes, much has been written and more has been said on this controversial topic. The reader who wishes to find out how far along this rocky road the theorists have progressed can do no better than buy Dr. Slater's book on "The Theory of Unimolecular Reactions". If he is a chemist he will be interested, of course, to find out, but if he is not also a competent mathematician his success in finding out will be distinctly limited. This is a purely mathematical approach, as indeed it must be at this stage, and the writer quite properly makes few concessions to those who are not mathematically inclined.

This book is an expanded version of a series of lectures delivered at Cornell in 1955 in which the author elaborates his theory of homogeneous dissociation processes and isomerization reactions and gives a critical and quite excellent review of earlier theories.

The author takes a simple model and, having analysed in some detail the dynamics of the system, proceeds to calculate the rate constant in terms of the frequency with which the normal vibrations come sufficiently into phase to give a critical distortion of some particular molecular co-ordinate or configuration. In other words, the molecule is assumed to dissociate if and when it reaches one of a set of critical internal configurations. The author elaborates the consequences of this simple model and provides a technique for the calculation of reaction velocities. In subsequent chapters, the theory based on this harmonic model is expanded to deal with general and low concentrations and a small number of selected reactions is discussed in detail.

This book is for the specialist in kinetics but no one who aspires to be a specialists can afford to be without it.

R. C. PINK

Chemist's Bookshelf

POLYTHENE UP-TO-DATE

POLYTHENE: 2ND EDITION. Edited by *A. Renfrew* and *P. Morgan*. Iliffe and Sons, London, and Interscience, New York, 1960. Pp. xxv + 781. Price 165s.

At the time the first edition of this book was drafted, the new routes in the polymerisation of ethylene had not been announced and so it happened that the first edition was out of date by the time it appeared in print. It did, however, establish for Britain the standard work on polythene, a position now consolidated by the second edition which is virtually a new book containing, as it does, not only the story of the high pressure polymers but that of the several low pressure materials as well.

The book is divided into three main parts. Part I, Manufacture and Properties, devotes a disappointingly short chapter to the four main methods of production but thereafter gives a comprehensive survey of the theory of polymerisation, the structure and the many aspects of the properties of this range of polymers. In the hands of such workers as C. E. H. Bawn, C. W. Bunn, A. Charlesby, R. N. Haward, etc., the authority of one volume must be accepted as the highest possible. Once again, however, it may well be that with recent advances in polypropylene and hydrocarbon chain polymers in general a third edition on a still broader basis will be needed in a very few years' time.

This leads to the most serious criticism of the work. Part I is really a book in itself and for those whose main interest in plastics is in technology and applications these first chapters are of little value. Eventually one feels the work will have to be divided into two volumes and it would have been better to do this now rather than publish the present edition in such a massive form.

Part II deals effectively and authoritatively with all the aspects of the technology of polythene. There is, of course, overlapping but the editors have wisely resisted the temptation to try to eliminate it and each chapter is thus largely complete in itself.

With Part III, however, some more forceful editing would have improved the combined efforts of no less than a dozen contributors who have been responsible for only 100 pages on the applications of polythene.

The quality of the illustrations is first class both in layout and reproduction and the standard of proof reading is such that the only errors noticed are not worth mentioning. The table of contents and the index are fully adequate, the former being particularly detailed. The two appendices, one giving trade names and the other world production statistics, are both useful although, of course, they immediately date the book.

The compilation of a volume such as this is no mean task especially in a field where new developments occur in rapid succession. Modifications and additions have been made to the text right up to the last moment and both editors and contributors have done a magnificent job in bringing this second edition so nearly up to date.

J. H. COLLINS

Wide Coverage on Polysaccharides

POLYSACCHARIDES OF MICRO-ORGANISMS. By *M. Stacey* and *S. A. Barker*. Oxford University Press, 1960. Pp. x + 228. 30s.

The complex polysaccharides elaborated by micro-organisms are many and varied in both chemical structure and biological function. They are of importance not only in understanding the organisms from which they are derived, but also in relation to their medical applications and to their immunological specificities. This book brings together a vast amount of information which is scattered throughout the medical and scientific literature, and Professor Stacey and Dr. Barker are to be congratulated on their wide and up-to-date coverage of the topic. It will undoubtedly become the standard monograph in the field. The book, unfortunately, fails to provide a sufficiently critical appraisal of present knowledge and gives little indication of the many problems still awaiting solution.

The first five chapters describe the techniques employed for the isolation and purification of these polysaccharides, and for unravelling the complexities of their molecular structures. All too frequently, however, the operations are described in some detail, but with little mention of the information which is to be derived from them. This criticism applies particularly to the chapter on structural determination, where the non-specialist would have considerable difficulty in assessing the value of the methylation and partial hydrolysis methods. Indeed, the authors describe how polysaccharides may be methylated and how the methylated sugars, which are formed on hydrolysis of methylated polysaccharides, may be separated and identified, but fail entirely to mention why these experiments are performed.

The value of enzymic methods for structural determination is not indicated, although the results of enzymic reactions are presented at a later stage. The remaining seven chapters of the book provide a complete summary of present knowledge of the polysaccharides of gram-positive and gram-negative bacteria, viruses, rickettsia, moulds, yeasts, yeast-like fungi, and protozoa.

This is a good book in many respects, but one which might have been much better. At the price it is excellent value.

G. O. ASPINALL

Methuen Monograph on Vitamin B-12

VITAMIN B 12. By *E. Lester Smith*. Methuen's Monographs on Biochemical Subjects, London, 1960. Pp. xii + 196. 15s.

In 1948 vitamin B 12 in the form of a red, crystalline compound, was isolated independently and almost simultaneously by research teams working in the laboratories of Merck in the U.S. and Glaxo in Great Britain. Dr. Lester Smith's account opens by tracing the nine distinct and originally independent lines of research which converged upon the clinical treatment of the megaloblastic anaemias. Five of these led to cyanocobalamin, the other four of folic acid, a closely associated vitamin. The history of these investigations is a real-life detective story in its own right.

If liver and farmyard manure had remained the main sources of the vitamin, it would have been just an expensive biochemical curiosity. As it happened, the fermentation processes evolved a few years previously for the commercial biosynthesis of streptomycin and chlortetracycline, and the micro-organisms employed in these, proved obligingly versatile, and so vitamin B 12 could be produced and purified on an economic basis.

As the author points out in his preface, several symposia on the vitamin have already been held in various parts of the world, the full record of one of which would fill a book six times the size of this slim volume. Readers who look for a comprehensive but essentially background study of vitamin B 12 and its relatives will therefore feel grateful to Dr. Lester Smith for offering them this summary, which deals with the chemistry, physiology and clinical applications of the compound and related factors. There are copious references at the end of every chapter to significant papers published up to mid-1958.

PETER COOPER

B.P. Plant for Boiler Corrosion Studies

A NEW laboratory where the problems of corrosion in boilers can be studied has been opened by the British Petroleum Co. Ltd. on a site adjoining their Kent oil refinery. For some years B.P.'s research organisation has been investigating high and low temperature corrosion in industrial boilers, and the associated problem of air pollution from boiler stacks.

The boiler itself, specially designed to B.P. specifications by Babcock and Wilcox, is of a two-drum water tube type, with an economiser, air heaters and flue-gas recirculation system. The design permits the boiler to be operated under a varied range of conditions.

POSSIBLE ROUTE TO LINEAR BORON POLYMERS AVOIDS RING FORMATION

PROBABLE production of linear polymers containing boron and nitrogen has been reported in a paper by W. Gerrard, of the Northern Polytechnic, entitled 'The experimental approach to the preparation of applicable borazole derivatives'. This paper was among those presented at the symposium on the high temperature resistance and thermal degradation of polymers held by the Plastics and Polymer Group, Society of Chemical Industry, on 21-23 September.

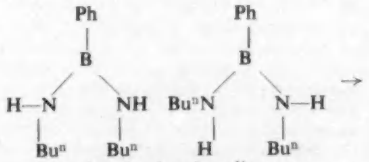
Boron-nitrogen systems show good polymerising tendencies but they normally form trimeric cyclic compounds. Part of the work carried out by W. Gerrard and his colleagues has been to explore the means of producing linear polymers by avoiding formation of the borazole ring. This would enable the length of the polymer chain to be controlled and thus make possible better organisation of any further research on these compounds.

It was postulated that prevention of ring formation could be brought about by introducing some measure of steric inhibition to ring formation. The author accomplished this by using phenylboron dichloride and a butylamine (RH_2; R = *n*-Bu, *s*-Bu, *iso*Bu) as reactants. These were mixed in ether when amine hydrochloride immediately separated out and the other primary product, judged to be bis(butylamino) phenylboron remained in solution

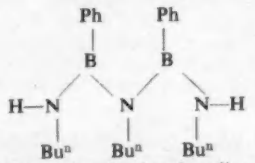
$$PhBCl_2 + 4BuNH_2 \rightarrow PhB(BuNH)_2 + 2BuNH_3Cl$$

During the evaporation of the ether under reduced pressure some amine was extruded leaving a residue of a pale yellow liquid. At no stage was there evidence of the formation of a borazole ring.

Distillation of the primary liquid residue, obtained using *n*-butylamine, yielded a clear colourless liquid, b.p. 119°-121°/0.4 mm., formed by the extrusion of *n*-butylamine which is believed to be N-bis(*n*-butylaminephenylboron)*n*-butylamine.



Bis-*n*-butylaminophenylboron

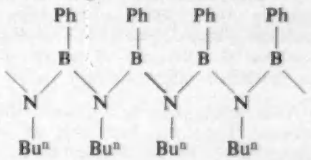


N-bis-(*n*-butylaminophenylboron)*n*-butylamine

On heating the *n*-butyl dimer under reflux at 300°C for 24 hours, *n*-butylamine was eliminated and a distillate 110°-170°C/0.3 mm., comprising several entities of various degrees of polycondensation, and a solid residue (B, 10.2%; N, 9.8%), m.p. 147°-149°C were obtained. Separation of the constituents of the distillate yielded materials having B, 8.0; N, 12.7%; and B, 10.3; N, 8.8%; whereas the borazole $C_{30}H_{42}B_3N_3$ would have B, 6.8; N, 8.8%.

The solid residue was easily hydrolysed by boiling water, showing a 90% decomposition in 45 minutes. Ostwald's viscometer measurements on solutions of the residue in chloroform indicate a chain length of 20 for *iso*butyl and 40 for the *n*-butyl systems.

It is provisionally postulated that chain polycondensation occurs by elimination of *n*-butylamine, and that borazole rings are not formed.



Also in his paper W. Gerrard dealt with the electron density distribution in substituted borazoles, so that factors influencing hydrolysis, thermal stability, and polycondensation might be more definitely assessed; the connection of borazole rings together via boron and nitrogen in the rings, or via boron and boron through nitrogen, etc.; and the linkage of borazole rings together via phosphorus oxygen linkages, by a procedure related to that of the alkylphosphateboron trihalide system.

Research is Natural Rubber's Answer to Synthetics

PROVIDED natural rubber producers continue their basic research and technical development in the right direction, and produce natural rubber in the most economical way, they can meet the challenge of the newer synthetics. This was the view of Professor Geoffrey Gee, C.B.E., F.R.S., Sir Samuel Hall, Professor of Physical Chemistry, Manchester University, expressed during the closing stages of the Natural Rubber Research Conference at Kuala Lumpur. The conference was attended by 300 delegates from 20 countries.

Sir Geoffrey Clay, controller of rubber research, said that "In his review, Professor Gee showed how opinion on the future of natural rubber had fluctuated in the past, and how the idea was once more abroad that the days of natural rubber are numbered. But, in his own thoughtful and elegant analysis he showed clearly that no single elastomer is supreme in all respects and that each of them, including natural rubber, can hold its place—in the expanding market for elastomers—as one of a range, each with its own special function for the consumer. He also brought home to us the striking results which can be obtained by blending natural with synthetic. . . "

In this connection Sir Geoffrey said the position would soon be reached when "the production of all types of new rubbers, including synthetic and natural, will be of a capacity which is more than needed to meet the new rubber requirements of the manufacturer. In the light of such a development, I cannot help feeling that research on the product, aimed at producing modified natural rubbers for particular purposes, possibly associated with the blending of natural and synthetic rubbers for particular uses, must be a major consideration in the policy on research into the product."

Hailsham Says Secrecy is Overdone

THE need to exchange knowledge was stressed by Viscount Hailsham, Minister for Science, in opening the Second International Synthetic Rubber Symposium, held at Church House, Westminster, on 11-13 October under the auspices of *Rubber and Plastics Age*. Lord Hailsham said that he is convinced that the secrecy policy was overdone and that the advantages were often overestimated. The ethical tradition of science is to exchange knowledge and, Lord Hailsham believes, the advantages of so doing have been overlooked by industry. The sharing of ideas had two possible effects: it kept people on the alert for the developments of others and prevented them resting on their laurels when they had achieved some development of their own.

Mr. G. E. Beharrell, chairman of the Dunlop Rubber Co., in introducing Lord Hailsham, had said that by 1970 the world consumption of synthetic rubber may well approach the 5 million tons per year mark. In 1956, 37.7% of the world consumption of rubber was synthetic but the figure was expected to have risen to over 45% by the end of this year.

The intensive research being carried out on cis-polybutadiene and cis-polyisoprene rubbers, products which had some chance of replacing natural rubber under conditions where low heat build up is required, as in the case of large tyres for commercial vehicles, could result in a material rise in the proportion of synthetic rubbers used. Several firms have already announced their intention of producing them commercially.

PEOPLE in the news

● At the annual meeting on Thursday of the Association of British Chemical Manufacturers, **Sir William Garrett, M.B.E., B.Sc., Ph.D.,** director of Monsanto Chemicals Ltd., was re-elected chairman for 1960-61. **Mr. John C. Hanbury, M.A., B.Pharm., F.R.I.C.,** chairman of Allen and Hanbury's Ltd., was re-elected vice-chairman.

● After seven years with Price's (Bromborough) Ltd., the last four as sales director, **Mr. B. R. Hook, B.Sc.,** has been appointed marketing member of the U.K. Chemical Group of Unilever Ltd. An Australian, Mr. Hook has worked in the U.K. since leaving Sydney University in 1946. He will be succeeded by **Mr. A. Vickery, M.Sc.,** commercial sales manager of Price's (Bromborough). A member of the firm's sales

B. R. Hook

A. Vickery

management since 1956, he has played a large part in developing Price's oleochemical activities. **Mr. R. E. Davies, M.A.,** sales manager for the north of England, Scotland and Ulster, succeeds Mr. Vickery as commercial sales manager. **Mr. T. A. Winney,** southern sales manager, becomes home sales manager, responsible for Price's selling activities throughout the U.K.

● **Mr. M. C. Coleman, B.Sc.(Eng.), A.M.I.Chem.E., M.S.M.A., A.F.Inst.Pet.,** has been appointed sales manager of the Clark Bros Co. Division of Dresser (Great Britain) Ltd., 197 Knightsbridge, London S.W.7.

● **Mr. Robert Balderston Risk, A.M.I.Chem.E.,** managing director of the Farmers' Company Ltd., Brigg, Lincs, has been elected president of the Fertiliser Manufacturers' Association, having been a member of council since 1952. He is also a member of the committee of the Superphosphate Manufacturers' Association, of which he was chairman in 1952-53. Educated at the Royal Technical College, Glasgow, he joined the Scottish Agricultural Industries' works in Scunthorpe, Lincs., in

R. B. Risk, new F.M.A. president

1925, and five years later joined the Farmers' Company. He was appointed to the board in 1948, and holds directorships with F.C.L. Crop Protection Ltd., and W. H. Barraclough (Hull) Ltd. He is the patentee of a process for the manufacture of 'complex' fertilisers and was a pioneer worker on the granulation of superphosphate based compounds. **Mr. J. S. Watkins, M.A., B.Sc.(Oxon),** who was recently elected F.M.A. vice-president, is fertiliser products sales manager at the I.C.I. Billingham Division. He entered the fertiliser industry 27 years ago when he started at Billingham as a research chemist.

● **Mr. William Jeremy Jones** has been awarded a research fellowship in physical chemistry at Trinity College, Cambridge.

● **Mr. Frank Ashworth, A.R.I.C.,** has been appointed works manager of Reddish Chemical Co. Ltd., Cheadle Hume, Ches, suppliers of detergents and sterilisers to the dairy, food, brewing, agricultural and other industries. Mr. Ashworth was previously production manager of Wm. Blythe and Co., heavy chemical manufacturers, Church, near Accrington.

F. Ashworth

P. D. O'Brien

● **Mr. P. D. O'Brien,** chairman of Laporte Industries Ltd., accompanied by his wife, left for a world tour on behalf of the company on the *Queen Elizabeth* from Southampton on Thursday. Following his arrival at New York, he will complete the remainder of his travelling by air. He is due back in this country just before Christmas. Australia is the main objective of the tour, as Laporte have a substantial business there which they are seeking to expand. Mr. O'Brien's itinerary also includes a visit to the associated company in Bombay, National Peroxide Ltd., who also have substantial expansion plans. "Laporte have always paid great attention to overseas markets," said Mr. O'Brien before departing, "and I personally have been greatly interested in the development of them." He recalled that in this connection he had visited some 30 countries on past trips. This would be his fourth visit to Australia and his third "circumnavigation of the globe."

● **Mr. D. W. H. Galbraith** has been appointed director of marketing of Chemstrand Ltd. He has been in charge of the sales department since July 1956, when the company opened their operations in the U.K.

● **Mr. S. P. Chambers, C.B.,** the chairman of Imperial Chemical Industries Ltd., and his wife recently returned to London following a five-day visit to Czechoslovakia at the invitation of the Government of that country to discuss general matters of trade between I.C.I. and Czechoslovakia.

● **Mr. W. A. Gardiner, B.Sc.(Hons.)** has been appointed to the board of May and Baker Ltd. He joined the company in 1935 as a research chemist under the late Dr. A. J. Ewins, F.R.S. In 1942, he was appointed assistant works manager and subsequently, chemical production manager. In 1955 he was

W. A. Gardiner

appointed assistant director of production at May and Baker and in 1957 he joined the Board of Pharmaceutical Specialities (May and Baker) Ltd. Mr. Gardiner has been closely associated with the planning and development of the new M. and B. factory at Norwich, where production commenced in 1957.

● **Mr. C. M. Fullgraf** has now assumed his responsibilities as managing director of Thomas Hedley and Co. Ltd. He was previously managing director of the Toilet Goods Division of the Proctor and Gamble Co. (Hedley's parent company), and a member of the Proctor and Gamble administrative committee in Cincinnati, Ohio. **Mr. K. W. Streith,** who has been Hedley's managing director since August 1958, is on leave of absence on a special assignment to develop further Hedley's export business with particular emphasis on the Outer Seven.

● **Dr. James Cook, Ph.D., Hon.Sc.D., F.R.I.C., F.R.S.,** vice-chancellor of Exeter University since 1955, and **Pro-**

(Continued in p. 641)

Commercial News

- **Greeff-Chemicals Raise Interim to 7½%**
- **Bakelite's One-for-five Scrip Issue**
- **Parke Davis Revise 1960 Profit Estimates**
- **Schering AG Turnover Up 20%**

Bakelite

A scrip issue on a one-for-five basis is being proposed by Bakelite Ltd. When this issue has been approved the directors intend to recommend the payment of an interim dividend for 1960 of 6% on the increased capital (same for 1959 on the smaller capital).

Greeff-Chemicals

Greeff-Chemicals Holdings are raising the interim dividend to 7½% from an equivalent of 2½% on capital doubled by a one-for-one scrip issue. Results for the first six months of 1960 are satisfactory. The higher interim reduces the disparity between dividends. But the aggregate distribution of profits by way of dividend for 1960 will not necessarily be greater than for 1959. The total for last year was equivalent to 15% on the present capital.

G.E.C.-Simon-Carves

G.E.C.-Simon-Carves Atomic Energy Co. has been formed as a private company to take over the existing G.E.C. Simon-Carves Atomic Energy Group, which has been a 'loosely-knit organisation.' Capital of the new company is £50,000.

Metal Closures

The directors of Metal Closures Group and F. Francis and Sons (Holdings), steel drum makers, have begun merger discussions. Combined assets would exceed £9 million. Metal Closure have recently acquired John Dale and Ideal Capsules, while F. Francis have just declared unconditional their offer for Lacrinoid Products.

Canadian Industries

Canadian Industries Ltd., continuing to diversify their plastics operations, have acquired R. D. Cattermole Ltd., pioneers in the development of polythene film packaging and one of the leading flexible film converters in British Columbia, and M. and D. Industries Ltd., British Columbia's only extruder of polythene film.

Both companies have plants in New Westminster. C.I.L. say the two firms will continue to operate under their present names and managements. Purchase price is not disclosed.

Podbielniak Inc.

The business of Podbielniak Inc., makers of centrifuges, distillation and other plant equipment, Chicago has been acquired by Dresser Industries, Dallas, Texas.

Sasol

Sasol, the world's largest oil-from-coal plant, is spending another £3½ million on developments to increase and speed production. This announcement follows the earlier news that Sasol had declared a first profit, produced from a turnover of £8,197,000, for the financial year 1959-60. The new development scheme will be financed partly out of income, and should be completed towards the middle of next year. It will round off the first phase of Sasol's development for which the capital allocation has been £48 million.

The value of Sasol chemical products is about £2½ million a year. Petrol, diesel oil and related products brought in nearly £6 million last year.

Chemie-Verwaltungs-AG

Chemie-Verwaltungs, the Frankfurt-on-Main holding company which owns one-half of Chemische Werke Hüls AG, Marl, have introduced their shares to the stock exchanges of Frankfurt, Berlin, Dusseldorf, Hamburg and Munich. The company has a total capital of well over £10 million.

Monsanto Canada

Robinson Cotton Mills plan to sell their two wholly-owned plastics subsidiaries (Robinson Mould Products and Robinson Foams) to Monsanto Canada Ltd., together with a 10-years' lease for part of their Woodbridge, Ont., plant and their former head offices in Toronto. Reason for the sale is a switch from foam rubber usage to plastics foam.

Parke Davis

The U.S. concern Parke Davis have had to re-estimate profit and turnover levels for the current year. It is now believed that in 1960 net profits will be only some 5% above last year's figure of $2.09 per share, instead of 15% more as had formerly been estimated. Turnover will probably rise by 6 to 8% on the 1959 total of $191,527,000, and not by 12% as had been forecast earlier.

Schering AG

Turnover of Schering AG, West Berlin, was up 20% in 1959 and exports again accounted for 49% of turnover; 58% of turnover went to Common Market countries, including West Germany. Of the investment total of DM21.5 million, DM16.6 million were spent in Berlin. Sales increase in pharmaceuticals was 17.7% with exports up 23%. Sales of insecticides and weedkillers in Germany rose 44%, while exports remained at the 1958 level.

A plant is in hand in the works area of Chemische Werke Bergkamen AG, who were acquired during the year, for the production of synthetic resins on a fatty acid basis. For this company, present production is confined to fuel and other hydrocarbons by the Fischer-Tropsch process.

NEW COMPANY

SHELL CHEMICAL COMPANY OF EASTERN AFRICA LTD. Cap. £20,000. Solicitors: J. G. Theaker, St. Helen's Court, Gt. St. Helen's, E.C.3.

INCREASE OF CAPITAL

ALBRIGHT AND WILSON LTD., Aldbury, near Birmingham. Increased by £1,000,000 in 250,000 cumulative preference shares of £1 and 3,000,000 ordinary shares of 5s each beyond the registered capital of £12,000,000.

DIARY DATES

MONDAY 17 OCTOBER

C.S.—Durham: Science Labs., Univ., 5 p.m. 'Chemistry & the detection of crime', by Dr. H. J. Walls.

C.S.—Leicester: Univ., 4.30 p.m. 'Excitations & molecular crystals', by Prof. D. P. Craig.

Plastics Inst.—Glasgow: Kenilworth Hotel, 7.30 p.m. 'Recent developments in polypropylene', by J. T. Grayling.

TUESDAY 18 OCTOBER

O.C.C.A.—London: 26 Portland Pl., W.1, 7 p.m. 'Lacquering of aluminium-magnesium alloys', by R. D. Griniski & F. M. P. Meredith.

WEDNESDAY 19 OCTOBER

Plastics Inst.—Wolverhampton: Victoria Hotel, 7.30 p.m. 'Survey of reinforced laminates, Part I: Polyesters'.

S.C.I.—Dublin: Chemistry Dept., Trinity Coll., 5.30 p.m. 'Some topics in the physics & chemistry of glasses', by Prof. R. W. Douglas.

S.C.I.—London: 14 Belgrave Sq., S.W.1, 6 p.m. 'Anodic protection', by Dr. C. Edeleanu & J. B. Cotton.

THURSDAY 20 OCTOBER

C.S.—Glasgow: Royal Coll. of Science & Tech., 3.30 p.m. 'The effect on food of recent advances in chemistry', by Dr. Magnus Pyke.

C.S. with R.I.C.—Sheffield: Chemistry Dept., Univ., 4.30 p.m. 'Amine oxidation', by Prof. H. B. Henbest.

I.Chem.E.—London: Livery Hall, Guildhall, E.C.2, Two-day symposium on 'Adsorption in industry'.

S.C.I. with C.S. & R.I.C.—Belfast: Chemistry Dept., Queen's Univ, 7.45 p.m. 'Unconventional processing of forage crops', by N. W. Pirie.

S.C.I.—Derby: College of Art, 7.30 p.m. 'Big rings', by Prof. R. A. Raphael.

S.C.I.—Liverpool: Donnan Laboratories, Grove St., 7.30 p.m. 'New horizons in polymer science', by Prof. C. E. H. Bawn.

S.C.I. with Textile Inst. & S.D.C.—Manchester: Lesser Free Trade Hall, 9 a.m. Symposium on 'Bonded fibres'.

Soc. Instrument Tech.—Bristol: Physics Dept., Univ., 7.30 p.m. 'Characteristics of differential producers for flow measurement', by H. E. Dall.

Soc. Instrument Tech.—Grangemouth: Leapark Hotel, 7 p.m. 'Analytical instruments for process control', by Dr. D. G. Stevenson.

FRIDAY 21 OCTOBER

C.S.—Birmingham: Chemistry Dept., Univ., 4.30 p.m. 'Mechanism of polymerisation catalysed by ionic catalysts'.

C.S.—Exeter: Washington Singer Laboratories Lab., 5 p.m. 'Triplet state in industry', by Prof. G. Porter.

Plastics Inst.—Birmingham: James Watt Memorial Inst., Gt. Charles St., 6.30 p.m. 'Progress in reinforced plastics', by L. H. Vaughan.

TRADE NOTES

Factice in Nitrile Rubbers

Anchor Chemical Co. Ltd., Manchester 11, have issued a bulletin which describes the behaviour of two Anchor grades of factice in nitrile compounds. They are: 854, oil-resisting factice; and 820, third grade dark factice. Factice is a useful and economic process aid for nitrile compounds and may be used in partial replacement of ester plasticisers or in addition to plasticisers already present. It is extracted by petrol to a lesser extent than the ester plasticiser.

Petrol Resistant Polyester

Polyester 430, described in technical data sheet No. 20 published by the Geigy Co. Ltd., Rhodes, Middleton, Manchester, has been designed for use in formulations where outstanding resistance to petrol, fats and oils is essential, but where resistance to aqueous extractants is less important. Oil and fat resistant sheeting and p.v.c. for adhesive laminates are among the suggested uses.

Shandos Equipment

Recently introduced ranges of microlitre syringes, gas-tight syringes and Lamda pipettes are described in a leaflet issued by Shandos Scientific Co. Ltd., 6 Cromwell Place, London S.W.7. The microlitre syringes are designed for highly accurate liquid discharges in the range of 0.02 to 500 microlitres. Gas-tight syringes for pipetting gas, corrosive liquids, etc., are particularly recommended for liquids which cement syringe plungers to the barrel. They incorporate a stainless steel plunger coated with Teflon resin and with a Teflon tip.

Bakelite Cut Epoxide Prices

Bakelite Ltd., 12-18 Grosvenor Gardens, London S.W.1, have substantially reduced the price of their standard grades of epoxide resin. These reductions came into effect on 1 October.

Regal RSF Black

Now in production at Stanlow, Ches., by Cabot Carbon Ltd., is Regal SRF. Price per lb. net ex-works for minimum 3-ton deliveries is 6¼d, and 7d for smaller quantities. Samples and technical data can be obtained from Cabot Carbon Ltd., 62 Brompton Road, London S.W.3. To permit the precise control of carbon black structure, the Regal process is being used for Regal SRF to duplicate on the oil furnace process, the characteristics of Cabot American gas-produced SRF types.

Sales Agencies

K. A. Ballard Ltd., Woodthorpe, Church Road, Worcester Park, Surrey, have been appointed sole agents in the South of England for Andrews Bros. (Bristol) Ltd., makers of road tankers in stainless steel and other metals and alloys, who are also general fabricators in stainless steel. They have also been appointed agents for the same area for Inness and Co. (Darlington) Ltd., valve manufacturers. In addition, Ballards have been appointed sales consultants to the petroleum, chemical and process industries for Rollo-Hardy and Co. Ltd., makers of Permbrite seam-welded stainless steel tubes and related products.

Kestner Evaporators

A fully illustrated loose-leaf brochure of a lavish, but bookshelf type, is available on request from the Kestner Evaporator and Engineering Co. Ltd., 5 Grosvenor Gardens, London S.W.1. Its contents are divided into 14 sections which describe the nature of the Kestner climbing film evaporator and the ancillary plant such as heat exchangers, coolers, condensers and vacuum raising equipment.

Titanium Heating Coils

No. 9 in the series of booklets 'I.C.I. Titanium for Chemical Plant', published by I.C.I. Metals Division, P.O. Box 216, Birmingham 6, describes various types of coils for both heating and cooling duties in the plating industry. Performance data for titanium coils in various corrosive media are tabulated.

Epophen Prices Cut

Leicester Lovell and Co., Southampton, have cut the prices of all their liquid and solid Epophen epoxide resins by 1s per lb. on all quantities. Similar reductions have been made in the prices of the non-irritant Epophen hardeners.

Boronated Bitumen Compounds

Berry Wiggins and Co. Ltd. have produced with the co-operation of Borax Consolidated, a range of boronated bitumen compounds. Of these, Kingsnorth compound No. 2028 (patent applied for) has already found commercial use as a biological shield in nuclear reactors. Kingsnorth compound No. 2028 contains a bitumen soluble boron compound which is free from problems associated with sedimentation. The presence of boron in combination with hydrogen in this new material will, when used at the recommended thicknesses, ensure complete attenuation and absorption of slow neutrons. Sample quantities are available from Berry Wiggins.

Cationic Surface Active Agent

Creto, a quaternary ammonium compound and a member of the cationic group of surface active materials, is described in a technical data sheet issued by Croda Ltd., Cowick Hall, Snaith, Goole, Yorks. Uses include prevention of static build up on surfaces of plastics articles.

Tioxide Paint Tests

Effects of weather conditions on the gloss retention of an alkyd paint pigmented with rutile titanium dioxide are discussed in publication BTP/76 from British Titan Products Co. Ltd., 10 Stratton Street, London W.1. The degree of gloss failure has been shown to be closely related to the amount of solar energy falling on the panel surface, total energy greater than a fixed threshold value being most closely related to the rate of deterioration.

People in the News

(*Continued from p. 638*)

fessor B. Bleaney, F.R.S., Professor of Experimental Philosophy, Oxford University since 1957, have been appointed members of the Council for Scientific and Industrial Research. With a third member not yet appointed, they succeed **Professor P. M. S. Blackett, F.R.S., Sir Eric Ashby** and **Mr. H. Douglass.** Dr. Cook became a Professor of Chemistry at London University in 1935 and was professorial lecturer in chemistry at Chicago University in 1938. Regius Professor of Chemistry at Glasgow University from 1939 to 1954, he was president of the Royal Institute of Chemistry from 1949 to 1951.

● **Dr. J. I. G. Cadogan** and **Dr. T. C. Waddington** will receive their Meldola Medals, 1959, from **Mr. E. LeQ. Herbert,** president, Royal Institute of Chemistry, at the Royal Institution on 9 November, 5.45 p.m. The ceremony will be followed by the Meldola Medal lecture by Dr. Waddington on 'Liquid hydrogen halides as ionising solvents'; visitors will be welcome. Dr. Cadogan will give his lecture, on 'Recent developments in free radical addition reactions' on 1 November, 4 p.m., in the large chemistry theatre at Manchester University.

● **Mr. J. R. M. Whitehorn** has been appointed deputy overseas director of the Federation of British Industries.

Market Reports

GOOD DEMAND FOR COAL TAR PRODUCTS

LONDON Conditions show little change and apart from lower quotations for some of the non-ferrous metal compounds prices are well held. There has been a continued steady demand for industrial chemicals on home account with contract delivery specifications covering good volumes. New business for shipment has been reasonably good. Revised bases prices as from 6 October have been notified for dry white lead which is lower at £115 5s/ton, red lead at £102 5s/ton and litharge at £104 5s/ton. Copper sulphate is lower at £76 per ton, less 2% f.o.b. Liverpool.

Demand for fertiliser materials has been fair and affected to some extent by adverse weather conditions. Most of the coal tar products are firm and available supplies have no difficulty in finding an outlet. Rather more inquiry has been reported for pitch on home and export account.

MANCHESTER On the Manchester market for chemicals and allied products during the past week a generally satisfactory movement of supplies against contracts to the textile and allied industries and most other leading industrial outlets has been reported, and there has also been a fairly steady demand from shippers. Quotations have been well held, with little easing of any consequence. Most of the light and heavy coal tar products are also finding a reasonably good outlet.

In the market for fertilisers, there is a continued good demand for basic slag, and a fair movement of the compound and other lines under the rebate schemes.

SCOTLAND By and large, trading over the past week embracing all sections of the industry has been brisk. There are the usual pockets of quietness here and there, but these are offset by many factories which are working at continued high pressure.

There is little change in prices and generally speaking the prospects are favourable. Some hold-ups are occurring particularly with regard to orders for export, the delay being mainly the result of industrial unrest in connection with shipping.

As far as the agricultural side of the industry is concerned, a steady volume of business is being maintained in keeping with seasonable requirements.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 16 November

Hydrocarbon-substituted dinitrophenyl methacrylates. Rohm & Haas Co. **854 442**

Phosphorus-containing ethyleneimine derivatives and process for their manufacture. Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius & Brüning. **854 443**

Process for the manufacture of sorbic acid. Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius & Brüning. **854 383**

Catalytic hydrocarbon radio-chemical conversion process. Esso Research & Engineering Co. **853 950**

Anthraquinone vat dyestuffs and their use. Geigy, AG, J. R. **853 969**

Preparation of substituted tetrahydro-1:3-oxazine-2:4-diones. Lepetit S.p.A. **853 954**

Graft polymerisation utilising ionising radiation. Centre National de la Recherche Scientifique. [Addition to 809 838.] **853 970**

Graft polymerisation using ionising radiation as the graft polymerisation initiator. Centre National de la Recherche Scientifique. **853 971**

Penicillamine production process. Distillers Co. Ltd. **854 339**

Diphenylacetamide derivatives. Olin Mathieson Chemical Corporation. **853 955**

Allyl polymers. Imperial Chemical Industries Ltd. **854 207**

Substituted organic phosphine derivatives. Albright & Wilson (Mfg.) Ltd. [Addition to 842 593.] **854 182**

Polymerisation of ethylene. Imperial Chemical Industries Ltd. **854 385**

Polymerisation catalyst. Esso Research & Engineering Co. **854 386**

Polyamide manufacturing process. Imperial Chemical Industries Ltd. **854 223**

Preparation of purified single elements or compounds. National Research Development Corporation **853 975**

Production of resinous compositions. British Celanese Ltd. **854-191**

Method for the production of β-carotene and other closely related carotenes. Koninklijke Nederlandsche Gisten Spiritusfabriek N.V. **854 419**

Organosilicon modified polyesters. Farbenfabriken Bayer AG. **854 134**

Triazine azo dyestuffs. Imperial Chemical Industries Ltd. **854 432**

Polyester moulding compositions. Westinghouse Electric Corporation. **854 137**

Reactive resin systems. Kenilworth Manufacturing Co. Ltd. **854 344**

Chromium-containing benzene-monoazo-naphthalene dyestuffs and their use. Geigy AG, J. R. **853 398**

Cycloheximide thiosemicarbazone and pesticidal compositions containing same. Upjohn Co. **854 433**

Production of N-carboxy-alpha-amino acid anhydrides. Courtaulds Ltd. **854 139**

Itaconic ester adducts of bromotrichloromethane and their preparation and compositions thereof. Pfizer & Co. **854 345**

Plasticisers and plasticised compositions. Howards of Ilford Ltd. **853 999**

Electrolytic production of alkali metal phosphates. United States Borax & Chemical Corporation. **854 145**

Conversion of hydrocarbons into gases containing methane, carbon monoxide and hydrogen. Gerhold, M. **854 150**

Fungistatic plywood glues. Monsanto Chemicals Ltd. **854 156**

Difficulty inflammable styrene polymers compositions and their production. Badische Anilin- & Soda-Fabrik AG. [Addition to 825 611.] **854 347**

Aqueous polymeric coating compositions. Imperial Chemical Industries Ltd. **854 346**

Production of N-carboxy-alpha-amino acid anhydrides. Courtaulds Ltd. [Divided out of 854 139.] **854 140**

Process for the polymerisation of unsaturated compounds. Farbenfabriken Bayer AG. **854 348**

Phosphorus esters and process for their preparation. Rhone-Poulenc. **854 351**

Water-soluble azo dyestuffs and their production. Badische Anilin- & Soda-Fabrik AG. **854 158**

Pyrimidines. Imperial Chemicals Industries Ltd. **854 011**

Process for the production of a silica pigment. Columbia-Southern Chemical Corporation. **854 014**

Glazed siliceous catalyst and process utilising said catalyst. California Research Corporation. **854 251**

Anthraquinone compounds and their production. Eastman Kodak Co. **854 098**

Preparation of ammonium diluranate. Mallinckrodt Chemical Works. **854 235**

Resinous composition. Dow Chemical Co. **854 475**

Method of processing natural gas. Conch International Methane Ltd. **854 099**

Thermoplastic compositions comprising polyvinyl-aromatic compounds. Styrene Products Ltd. **854 238**

Polymeric organo-boron compounds and their preparation. United States Borax & Chemical Corporation. **854 270**

Process for the recovery of catalyst in oxidation reactions with nitric acid. Stamicarbon N.V. **854 275**

Macromolecular polyformaldehyde stabilised against oxygen and heat. Badische Anilin- & Soda-Fabrik AG. **854 278**

Process for the manufacture of piperazine. Dow Chemical Co. **854 378**

Process for purifying sorbic acid. Farbwerke Hoechst AG, Vorm. Meister, Lucius, & Brüning. [Divided out of and addition to 850 373.] **854 239**

Polyester compositions. Chemstrand Corporation. [Divided out of 853 422.] **854 032**

Calcining of gypsum. Aspegren, O. E. A. **853 812**

Process for the production of chlorinated hydrocarbons. Columbia-Southern Chemical Corporation. **853 754**

Piperazine derivatives and process for the preparation thereof. Morren, H. **853 783**

Process for the production of cross-linked elastomers. Farbenfabriken Bayer AG. **853 640**

Piperidine compounds and their preparation. McElvain, S. M. **853 814**

Organo dihaloborines. American Potash & Chemical Corporation. **853 379**

Steroid compounds and their preparation. Laboratories Francais De Chimiotherapie. **853 402**

Aminoaralkyldihydroxybenzenes, their O-acyl derivatives and their use in photographic processes. International Polaroid Corporation. [Divided out of 853 479.] **853 482**

Production of orthoformic acid esters. Lonza Electric & Chemical Works Ltd. **853 405**

Preparation of alkaline earth metal titanates. National Lead Co. **853 784**

Petroleum spirit. Scott, T. **853 957**

Process for the manufacture of titanium dioxide pigments. Laporte Titanium Ltd. **853 959**

Reduction of nickel oxide. Mond Nickel Co. Ltd. **854 461**

Synthetic resin products containing plasticisers. Howards of Ilford Ltd. **854 017**

Azo-dyestuffs derived from 1:3-dihydroxy phenyl ketones. Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius & Brüning. **854 404**

Cyclopentanophenanthrene derivatives and process for the preparation thereof. Syntex S.A. **854 464**

Vat dyestuffs of the anthraquinone series and a process for their manufacture. Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius, & Brüning. **854 162**

Cyclopentanophenanthrene derivatives and processes for the production thereof. Syntex S.A. **854 466 & 854 407**

Production of filament forming mixed polyesters. Vesely, R., and Zamorsky, Z. **854 171**

Electrothermic production of hydrogen cyanide by fluidised bed techniques. Shawinigan Chemicals Ltd. **854 268**

Electrolytic cells. Pechiney. **854 173**

Process for the manufacture of aliphatic-substituted ketenes. Wacker-Chemie GmbH. **854 102**

Preparation of mono-crystalline structures. Motorola Inc. **853 979**

Process for the preparation of highly crystalline polyethylene of pre-established degree of polymerisation. Montecatini. **854 164**

Steroids and the manufacture thereof. Upjohn Co. **853 981**

Production of alkyl, aryl and aralkyl esters of acids of trivalent phosphorus. Virginia-Carolina Chemical Corporation. **853 982**

Preparation of olefins. Esso Research & Engineering Co. **853 983**

Polyvinyl resin compositions. Howards of Ilford Ltd. **853 968**

Dyestuffs for dyeing and printing fibre mixtures which contain fibres containing acrylonitrile. Badische Anilin- & Soda-Fabrik AG. **853 985**

Manufacture of tri-substituted boranes. Olin Mathieson Chemical Corporation. **854 179**

Substituted adipates and preparation thereof. Rohm & Haas Co. **854 382**

Open to public inspection 23 November

Method of joining sheets of expanded thermoplastic synthetic resin. Agricola Reg. Trust. **854 518**

Rubber compositions. Dunlop Rubber Co. Ltd. **854 613**

Ion-exchange resins. United Kingdom Atomic Energy Authority. **855 009**

Polyoxyalkylene surface active agents. Wyandotte Chemicals Corporation. **855 010**

Processes for stapling fibres of polyesters. Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius, & Brüning. **854 900**

Process for the manufacture of substituted pyrazolopyrimidines. Ciba Ltd. **854 631**

Manufacture of pyrazoles. Ciba Ltd. **854 632**

Process for the production of boron hydrocarbons and aluminium hydrocarbons. Studiengesellschaft Kohle. **854 919**

Production of polyethylene. Mitsui Chemical Industry Co. Ltd. **854 988**

Process and apparatus for production of carbon black. Phillips Petroleum Co. **854 750**

Manufacture or treatment of lithium aluminium hydride addition products. Olin Mathieson Chemical Corporation. **854 527**

Treatment of saponified stretched cellulose ester filamentary material. Celanese Corporation of America. **854 920**

Process for removing caffeine from coffee extracts. Hag, AG. **854 703**

Process for purifying trifluorochlorethylene. Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius, & Brüning. **854 991**

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PATENTS & TRADE MARKS

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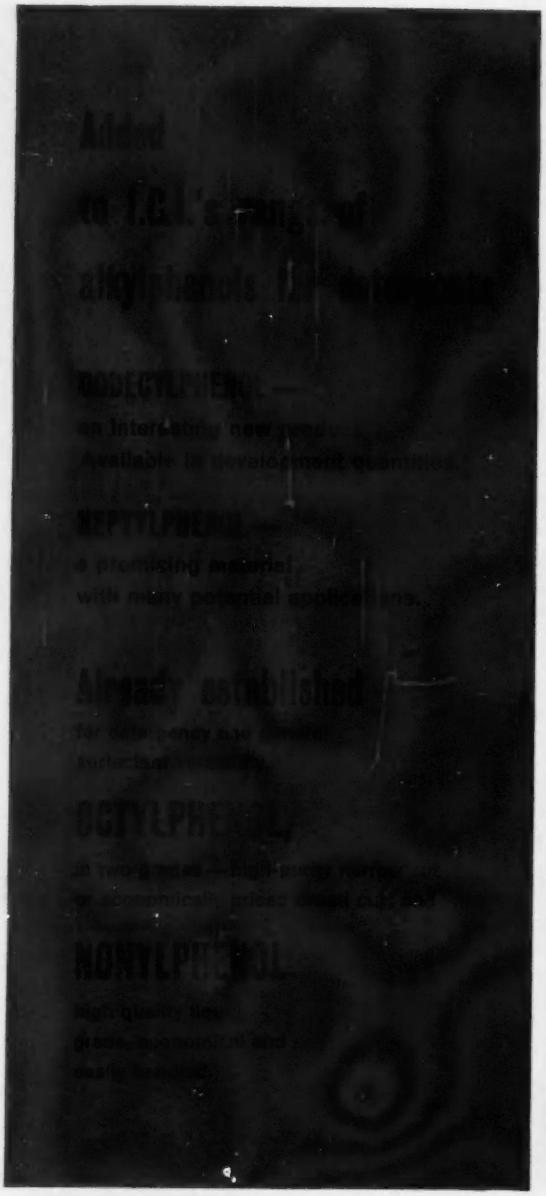

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